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THE EFFECT OF CONTAMINANTS ASSOCIATED WITH SUSPENDED SEDIMENT ON WATER QUALITY IN THE TORONTO WATERFRONT DURING 1985

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THE EFFECT OF CONTAMINANTS ASSOCIATED WITH SUSPENDED SEDIMENT ON WATER QUALITY IN THE TORONTO WATERFRONT DURING 1985

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Water Resources Branch

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Le rapport présente les résultats d'une analyse portant sur la qualité de l'eau et les sédiments en suspension effctuée en 1985 à partir d'échantillons prélevés près du rivage de Toronto. Les échantillons ont été prélevés près de l'embouchure des rivières, de l'exutoire des usines d'épuration des eaux d'égout, des lieux ayant été soumis à un dragage ou à un remblayage et des prises d'eau des usines de filtration, ainsi qu'à des postes témoins. La période d'échantillonnage a duré d'avril à octobre. Les analyses de l'eau et des sédiments en suspension portaient sur la présence d'éléments nutritifs, de métaux à l'état de trace, de BPC et de substances organochlorées. Les échantillons d'eau ont été soumis à d'autres analyses portant sur la présence éventuelle de chlorophénols, de chlorobenzènes et d'acides de phénoxy. Les concentrations de phosphore, de cadmium, de cuivre, de fer, de nickel, de plomb, de zinc, de lindane, d'heptachlore, d'heptachlore époxyde, d'aldrine, de dieldrine, de pentachlorophénol et de métabolites du DDT ne respectaient pas les objectifs provinciaux en matière de qualité de l'eau à au moins un poste, et ce, à des fréquences diverses. La concentration de phosphore excédait la valeur préconisée par les lignes directrices. Les échantillons de sédiments en suspension passés au centrifugeur ont permis de constater que la concentration des matières solides, éléments nutritifs, métaux à l'état de trace et matières organiques à l'état de trace, près des usines d'épuration des eaux d'égout et de l'embouchure des rivières, était l'une des causes de la non-conformité aux objectifs provinciaux en matière de qualité de l'eau observée à certains endroits. Une comparaison qualitative des déversements quotidiens de polluants a permis de constater que l'usine d'épuration principale constitue la première source d'éléments nutritifs, de métaux et de matières organiques, les autres sources étant l'usine d'épuration de la rivière Humber, les rivières Humber et Don et le ruisseau Mimico (les polluants provenant des égouts et des opérations de remblayage n'ont pas été évalués). On recommande entre autres l'établissement de priorités suivant le plan d'assainissement, une enquête portant sur les effets biologiques des particules de métaux et de matières organiques, ainsi que l'évaluation des pratiques actuelles de traitement des eaux pluviales et de remblayage afin de réduire les déversements de sédiments en suspension.

FOREWORD

The data in this report were collected by the Great Lakes Section of the Ontario Ministry of the Environment's Water Resources Branch in order to: (a) characterize the physical and chemical nature of suspended sediments at major sources across the Toronto Waterfront and assess their impact on water quality; (b) assess the variability of water quality both across the waterfront and through time; and (c) estimate contaminant loadings at major waterfront sources.

This study was designed to build upon the results of previous investigations by the Great Lakes Section in the Toronto waterfront. These previous studies, undertaken since 1980, focussed on the effects of dredging and lakefilling at the Toronto Harbour and East Headland, and found that the short-term effects on water quality were localized and generally secondary to the effects of the Don River and the Toronto Main Sewage Treatment Plant. The 1985 study, therefore, included both water and suspended sediment sampling at the mouths of waterfront rivers (Mimico Creek, Humber River, Don River) and sewage treatment plants (Humber STP, Main STP) as well as near dredging and lakefilling operations in order to provide a measure of the relative significance of each source.

Results from this report have been provided to the federal-provincial writing team for the Toronto Remedial Action Plan (RAP). The report will also be of interest to harbour users, public interest groups, and federal, provincial and municipal agencies during their involvement with the public consultation component of the RAP.

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FINDINGS AND RECOMMENDATIONS

In 1985 the Great Lakes Section of the Ontario Ministry of the Environment conducted water and suspended sediment sampling across the Toronto Waterfront to characterize the physical and chemical nature of suspended sediments at major sources, to assess their impact on water quality, and to estimate contaminant loadings. Water samples were pumped from the depth of greatest turbidity at twelve locations across the study area and were analyzed for physical parameters, nutrients, trace metals and trace organics. Suspended sediment samples were obtained using a centrifuge at six source stations (rivers, sewage treatment plants, lakefilling) and were analyzed for physical parameters, nutrients, trace metals, and trace organics. Sampling was undertaken six times during the period from late April to late October.

Results of water and suspended sediment quality sampling have identified concerns with both the manner in which water quality data are collected and interpreted, as well as the potential impacts of contaminants associated with suspended sediments. A summary of findings appears below, along with a brief discussion and corresponding recommendations:

Findings

1. Localized areas within the Toronto Waterfront (chiefly in the vicinity of rivers, STPs, and lakefilling operations) exceed some Ministry water quality objectives for the protection of aquatic life, the magnitude and frequency of non-compliance varying according to parameter and location. Parameters of non-compliance include total phosphorus, cadmium, copper, iron, nickel, lead, zinc, lindane, heptachlor/heptachlor epoxide, aldrin/dieldrin, pentachlorophenol, and DDT and metabolites.

Discussions and Recommendations

The current provincial-federal effort to develop a Remedial Action Plan (RAP) for the Toronto Waterfront will determine the level of remedial effort necessary to improve localized zones of poor water quality following the identification of water use goals through the public involvement program. Water quality results from this report should form part of the information base for this process.

2. Finding

Suspended sediment concentrations of nutrients, metals, and trace organics are generally higher at the sewage treatment plant outfalls than at river mouths or the lakefilling operation. However, comparison of whole water chemistry (water plus suspended sediment) with results for suspended sediments alone, shows that water quality is more dependent on the quantity of suspended material in the water column than the quality of the suspended material itself.

Prior to deposition, contaminants associated with suspended sediments contribute to violations of Ministry water quality objectives for nutrients, metals and organics. They may also represent a direct source of contaminants for aquatic biota within the water column and, following deposition, to benthic and epibenthic biota.

Discussion and Recommendations

Future investigations should assess the bioavailability of contaminants associated with suspended sediments, as well as estimate the partitioning of various contaminants between aqueous and particulate forms. Investigations into bioavailability should employ direct bioassays, as well as geochemical analysis of the particulate matter. Results will be of assistance both in determining the potential sources of certain compounds, and in predicting their environmental fate. Such work will also complement ongoing research efforts of the provincial-federal Polluted Sediment Committee which is investigating the biological significance of inplace pollutants.

3. Finding

Contaminant loadings are largely related to flows, particularly at rivers. The Main Sewage Treatment Plant represents the single largest source of nutrients, metals, and organics to the waterfront, followed by the Humber Sewage Treatment Plant, the Humber River, the Don River, and Mimico Creek. Estimates of contaminant loadings have not been attempted for the lakefilling operation or for sewers discharging to the waterfront.

Estimates of partitioning between particulate and aqueous forms of phosphorus and most metals show the potential for substantial reductions in loadings of these substances to the waterfront by reducing the discharge of suspended sediments from rivers, sewage treatment plant outfalls, and the lakefilling operation.

Discussion and Recommendations

Reports of the Toronto Area Watershed Management (TAWMS) study, as well as those of the Urban Drainage Implementation Committee (UDIC), identify the need for more effective storm water management and control of diffuse urban and agricultural pollutant sources (including reductions of suspended sediment loads). The present study re-affirms the need for strengthening of these controls. The development of remedial options, as part of the Toronto RAP program, should include careful assessment of the TAWMS and UDIC reports.

The Toronto Main sewage treatment plant (STP) is one of six Municipal Industrial Strategy for Abatement (MISA) pilot sites for development of updated effluent requirements and receiving water track" impact assessment methodologies. Comprehensive field studies during 1986 and 1987 are to be used to assess the impact of treated effluent discharges on the receiving water ecosystem, leading to target requirements for improved effluent quality (including contaminants associated with suspended sediments) where necessary. Assessment of recommended remedial measures at the Main STP as a result of the MISA study will be included in the public involvement program as part of the Toronto RAP process.

An evaluation of current lakefilling practices in Ontario has been initiated by the Ontario Ministry of the Environment. The investigation will assess the historical perspective of lakefilling, available design and construction methodologies, legal aspects, environmental impacts (including water, sediment, biota, soil, and littoral processes), and economic aspects. This evaluation will be used to develop policies and procedures for reduction of localized water quality impacts and sediment quality impairment due to the loss of material from lakefilling operations, and should form part of the information base for the Toronto RAP process.

4. Finding

Turbidity profiles show that substantial variation in the concentration of suspended sediment occurs throughout the water column.

Water quality sampling shows that no single sampling period can typify differences among sampling stations, nor can one sampling location represent differences among sampling periods.

Discussion and Recommendation

Future water quality investigations in the Toronto waterfront should be designed to accommodate the high degree of temporal and spatial variability found in water chemistry parameters. For example, depending upon the specific objectives of the survey, it may be necessary to obtain depth-integrated samples as a means of characterizing single station conditions. Survey objectives should be clarified before the survey design since widely differing sampling approaches may be necessary to ensure the collection of appropriate data.

1.0 INTRODUCTION

1.1 Background

The Great Lakes Section of the Ontario Ministry of the Environment (MOE) has conducted various investigations into the effects of dredging and lakefilling at the Toronto Harbour and East Headland (also known as the Leslie Street Spit) over the period 1980 to 1984 (Figure 1). These studies (Griffiths 1980, Griffiths and Winiecki 1981, Griffiths 1983, Boyd and Griffiths 1985, Boyd 1986) have determined that direct, short-term effects of both dredging and lakefilling activities on water quality were localized and generally secondary to effects of flows from the Don River and the Toronto Main Sewage Treatment Plant (Main STP) (Figure 1).

Results have shown aqueous concentrations of several trace metals (Cd, Cu, Fe, Pb, Zn) in excess of the Provincial Water Quality Objectives (PWQO) (MOE 1984) for the protection of aquatic life and recreation at sampling stations near the Don River mouth and the Main STP discharge, as well as in the vicinity of dredging and lakefilling operations. On accasion, aqueous concentrations of certain trace organics (PCB, dieldrin, lindane, DDT metabolites) have been detected at concentrations in excess of the PWQO, at the Main STP discharge or in the lower Don River. Concentrations of other trace organics (1,2,3,4 tetrachlorobenzene, dichlorvos, mevinphos) have also been detected near the Main STP discharge. However, the chlorobenzene compound (1,2,3,4-tetrachlorobenzene) did not exceed the PWQO, and no PWQOs exist for the organophosphorus compounds (mevinphos, dichlorvos). The detection of trace organics in water samples have not been attributable to either dredging or lakefilling activities and there has been no indication of direct adverse impacts on drinking water supplies.

Water column turbidity profiling has demonstrated that surface turbidity is not a reliable indicator of subsurface conditions. Also, collection of suspended sediments with a centrifuge has detected trace metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn) and trace

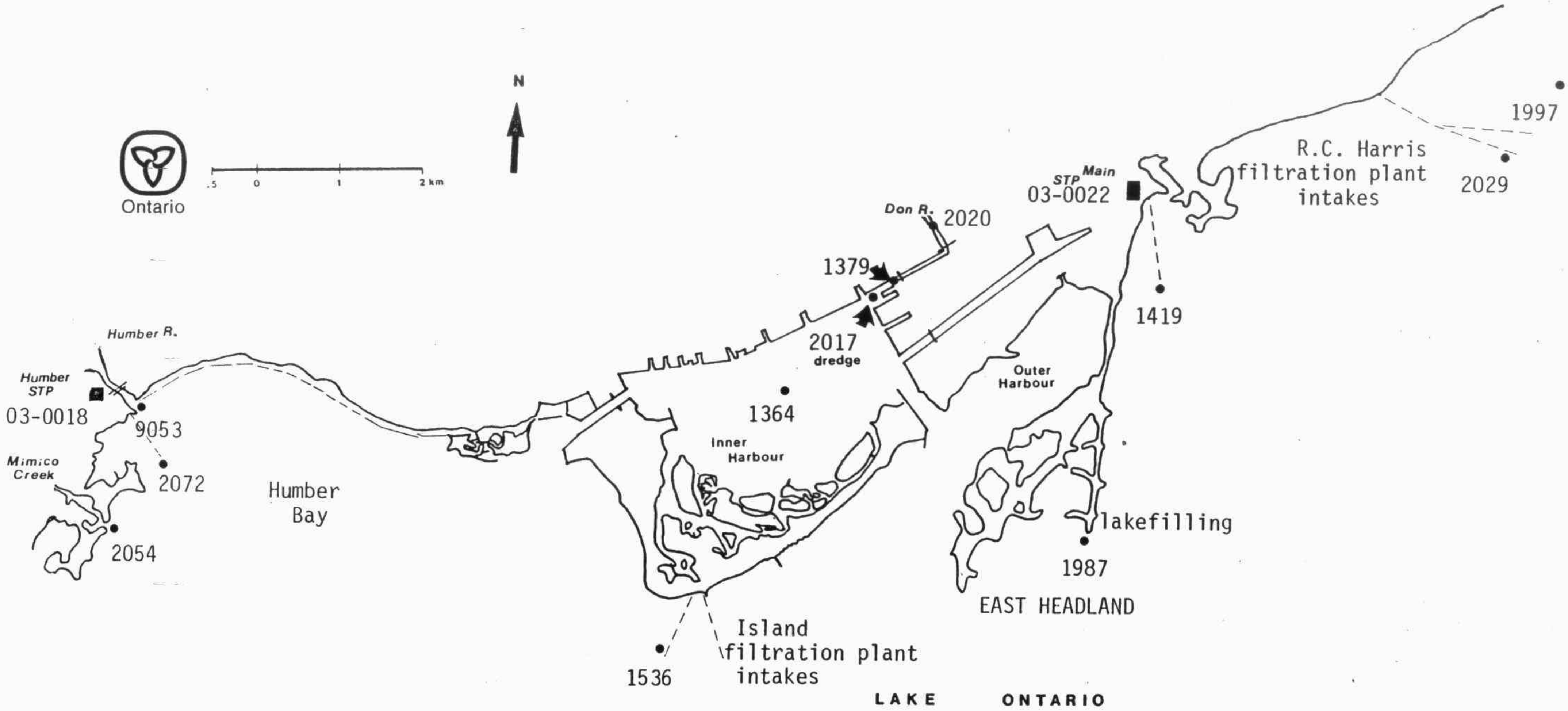

FIGURE 1: Study Area and Station Locations for 1985 Toronto Waterfront Study

organics (PCB, 2,4,5T, picloram, silvex, alpha-chlordane, gamma-chlordane, dieldrin, HCB, p,p-DDE, p,p-DDD, endosulphan I, endosulphan sulphate) at one or more of five stations across the waterfront (Don River mouth, dredge site, dredged material disposal site, lakefilling site, and Main STP discharge).

These suspended sediment findings have identified concerns regarding both the potential for direct adverse impact on aquatic biota through exposure in the water column, and the potential for long-term, indirect impacts on the aquatic ecosystem due to uptake and accumulation of trace contaminants by benthic organisms after transport and deposition. The most recent report (Boyd 1986), documenting 1984 sampling results, identifies the need for investigation of sediment transport, and for chemical characterization and bioassessment of suspended sediments at major sources across the Toronto Waterfront in order to address these concerns.

1.2 Objectives of 1985 Survey

The 1985 study was designed in response to the need for improved chemical characterization and assessment of suspended sediments at contaminant sources across the Toronto Waterfront. Sediment transport and bioassessment related studies are to be investigated during the 1986 and 1987 field seasons.

The 1985 objectives were to:

(a) characterize the physical and chemical nature of suspended sediments at major sources across the Toronto waterfront and assess their impact on water quality;

(b) assess spatial and temporal variation in water quality; and

(c) produce qualitative estimates of contaminant loadings for selected parameters at major waterfront sources.

2.0 SURVEY DESCRIPTION AND METHODS

2.1 Survey Description

Water quality sampling for physical parameters, nutrients, trace metals and trace organics (complete listing in Appendix A) was undertaken at 12 locations across the waterfront (Figure 1, Table 1). Each water sampling episode obtained two successive replicate samples from the depth of maximum turbidity at each of the station locations (with the exception of Stn. 2020 in the lower Don River where the water depth was usually less than 1.0 m). This was designed to permit quantitative comparison of the most turbid water at each station assuming that this represented the "worst case" for each location at the time of sampling. This assumption is most likely to be correct for those parameters which are strongly associated with suspended sediments (i.e. certain trace metals and organics). Water quality sampling was completed six times during the period from late April to late October.

Suspended sediment sampling with a centrifuge was undertaken at six source stations (Figure 1, Table 1) for selected physical parameters, nutrients, trace metals, and trace organics (complete listing in Appendix B). Each sampling episode at each station consisted of a collection of single sediment samples and single composite whole water (or effluent) samples from the pre-centrifuged stream. Samples were obtained from a depth of approximately 1.5 m at open lake or river stations, and in-plant from the estimated mid-depth at the STP treated effluent discharges. STP samples were obtained prior to chlorination of final effluent. Suspended sediment sampling was completed six times at each station (except the Humber STP) during the period from late April to late October.

2.2 Field Methods

Water column profiles of temperature and water clarity (percentage transmittance) were obtained with a Moniteq MTR 25 transmissometer package containing a 25 cm path-length transmissometer calibrated

TABLE 1: Toronto Waterfront 1985 Station Location Descriptions

Number	Description (depth)
2020	Don River background (1.0 m variable)
1536	In-lake at Island Filtration plant westerly intake (7.0 m)
2054*	Mouth of Mimico Creek (7.0 m)
2072	In-lake at Humber STP outfall (7.5 m)
0018*	In-plant at Humber STP (centrifuge only)
9053*	Mouth of Humber River (4.0 m)
1364	Inner Harbour background (8.0 m)
2017	At dredge site (if appropriate) (4.0 - 9.0 m)
1379*	Mouth of Keating Channel at Cherry St. Bridge (3.5 m)
1987*	At lakefilling location (17.0 m)
1419	In-lake at Main STP outfall (7.5 m)
0022*	In-plant at Main STP (centrifuge only)
2029	In-lake at R.C. Harris filtration plant intake (17.0 m)
1997	Background 1 km NE of stn 2029 (17.0 m)

* Indicates those stations where centrifuge sampling was undertaken. Centrifuge sampling at stations 2054 and 9053 was done from shore, slightly upstream from the lake stations illustrated.

to 75% in air, a temperature probe, a pressure transducer, and an X-Y chart recorder). Continuous water clarity profiles were recorded while lowering the sonde, and temperature profiles were obtained while raising the sonde. These profiles provided a means of estimating the depth of maximum turbidity (i.e. minimum water clarity) at each station.

Water quality samples were pumped from the desired depth using a March 5C MD submersible pump and teflon hose. Sample containers were filled, preserved (where appropriate), and stored according to MOE standard methods (MOE 1983) for the required range of tests. Field blanks for metals and organics analysis were obtained for quality assurance and control (QA/QC) by pouring double distilled water through the pump-hose system, and simultaneous replicates (i.e. split samples) were obtained at two randomly selected stations during each survey, also for QA/QC purposes.

Suspended sediments were pumped using the same type of pump-hose system, and were concentrated with a continuous flow Alfa Laval 103B centrifuge at a rate of approximately 6 litres per minute. The collected sediments were transferred to appropriate containers with a stainless steel scraper, and stored in the dark at 4°C for the desired range of tests, according to MOE standard methods (MOE 1983). An hourly composite sample of pre-centrifuged water was also obtained.

2.3 Laboratory Methods

Water quality analyses were undertaken by the Water Quality, Inorganic Trace Contaminant, Drinking Water Organics, and Trace Organics Sections at the MOE Laboratory Services Branch according to procedures outlined in MOE analytical methods (MOE 1983). Suspended sediments were submitted to the Inorganic Trace Contaminants, and Trace Organics Sections for the desired analyses according to MOE analytical methods.

3.0 SURVEY RESULTS

3.1 Water Clarity Profiling

Results of water clarity and temperature profiling have been summarized (Tables 2,3). Reading errors of ±0.5 m for depth, ±2.5 % transmittance for water clarity, and ±1.0°C for temperature have been estimated for field operation of the equipment, based on comparison of duplicate profiles.

Water clarity results (Table 2) show non-uniform turbidity profiles* at the majority of stations on virtually all sampling occasions. The most notable exception occurred on 23 October when only three of the ten stations profiled displayed minimum-maximum differences of greater than 5% transmittance. It is also apparent that relatively uniform turbidity profiles predominated at the shallow river mouth stations 9053 (mouth of the Humber River) and 1379 (mouth of the Don River).

Available temperature profiles (Table 3) (due to equipment failure no results were available for the October surveys) demonstrate minimum-maximum temperature differences of greater than 2.0°C at the majority of stations on all sampling occasions. The most extreme results were recorded on 17 July when temperature differences of as much as 10°C occurred (at Stn. 9053, the mouth of the Humber River).

3.2 Water Quality Sampling

A list of the 65 tests performed on water samples is contained in Appendix A. Water quality results for physical tests, nutrients and trace metals have been summarized for each parameter to show the sample ranges at each station (Table 4). A more complete data summary displaying percentages of results greater than the minimum measurable amount (MMA) and the Provincial Water Quality Objectives

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* The term "turbidity" will be used with the assumption that it is inversely proportional to water clarity.

TABLE 2: Summary of Water Clarity Profiling Results 1985 (% transmittance)

Sampling Date		STATION LOCATIONS										
		2054	2072	9053	1536	1364	2017	1379	1987	1419	2029	1997
April 23	Min.	45	11	3								
	(depth)	(1.5m)	(3.0m)	(1.5m)								
	Max.	51	18	3								
	(depth)	(3.0m)	(1.0m)	(1.5m)								
May 29	Min.	23	18	7	60	36	5	3	17	38	65	65
	(depth)	(3.0m)	(2.0m)	(1.0m)	(1.0m)	(4.0m)	(1.0m)	(2.0m)	(1.0m)	(1.0m)	(7.0m)	(7.0m)
	Max.	28	44	26	65	41	37	6	29	39	73	73
	(depth)	(6.0m)	(6.0m)	(3.0m)	(13.0m)	(1.0m)	(8.0m)	(1.0m)	(11.0m)	(5.0m)	(2.0m)	(2.0m)
July 17	Min.	24	5	3	65	25	No dredge	1	28	1	55	55
	(depth)	(1.5m)	(2.5m)	(1.0m)	(6.0m)	(3.0m)		(1.0m)	(1.0m)	(2.5m)	(5.5m)	(5.5m)
	Max.	57	65	52	77	62		1	82	53	70	70
	(depth)	(3.0m)	(7.m)	(3.5m)	(2.0m)	(7.5m)		(3.0m)	(16.0m)	(6.5m)	(1.0m)	(3.0m)
August 7,8	Min.	20*	3*	2*	59*	22	1	8	1	42	58	62
	(depth)	(1.0m)	(5.0m)	(1.5m)	(4.0m)	(8.0m)	(6.0m)	(1.0m)	(3.0m)	(1.0m)	(4.0m)	(5.0m)
	Max.	48*	30*	3*	70*	8	8	8	61	66	80	82
	(depth)	(5.0m)	(2.0m)	(0.5m)	(6.0m)	(6.0m)	(2.0m)	(2.0m)	(14.0m)	(6.0m)	(15.0m)	(16.0m)
October 17	Min.	29	12	27	33	3	No dredge	1	1	11	34	34
	(depth)	(3.0m)	(2.0m)	(1.0m)	(1.0m)	(7.0m)		(5.0m)	(10.0m)	(1.0m)	(5-16m)	(4-16m)
	Max.	33	31	28	33	26		13	36	31	41	39
	(depth)	(1.0m)	(4.0m)	(3.0m)	(8.5m)	(5.5m)		(2.0m)	(1.0m)	(6.0m)	(1.0m)	(1.0m)
October 23	Min.	26	17	32	33	27	No dredge	4	14	9	34	29
	(depth)	(3.0m)	(1.0m)	(1.0m)	(6.0m)	(6.0m)		(1.5m)	(7.0m)	(1.0m)	(1.0m)	(1.0m)
	Max	29	24	32	37	31		8	35	25	34	29
	(depth)	(1.0m)	(6.5m)	(2.5m)	(2.0m)	(1.5m)		(0.5m)	(1.0m)	(5.0m)	(16.0m)	(15.0m)

* denotes August 7 results

TABLE 3: Summary of Temperature Profiling Results 1985 (°C)

Sampling Date		STATION LOCATIONS										
		2054	2072	9053	1536	1364	2017	1379	1987	1419	2029	1997
April 23	Max.	11	9	15								
	(depth)	(surf.)	(1.0m)	(surf.)								
	Min.	5	8	11								
	(depth)	(3.0m)	(6.0m)	(2.5m)								
May 29	Max.	11	13	14	10	13	12	13	10	13	10	10
	(depth)	(surf.)	(surf.)	(surf.)	(0-2.5m)	(surf.)	(surf.)	(surf.)	(surf.)	(surf.)	(surf.)	(surf.)
	Min.	10	9	11	9	11	9	11	8	10	9	8
	(depth)	(5.0m)	(6.0m)	(3.0m)	(7.5-13m)	(7.0m)	(7.0m)	(2.0m)	(12.0m)	(3.5-5m)	(5-15m)	(5-14m)
July 17	Max.	12	14	17	14	17	No	19	11	13	13	13
	(depth)	(surf.)	(surf.)	(surf.)	(surf.)	(surf.)	dredge	(surf.)	(surf.)	(surf.)	(surf.)	(surf.)
	Min.	9	5	7	7	6		17	7	7	6	6
	(depth)	(1.5-5m)	(5.5m)	(2-4m)	(7.5m)	(7.0m)		(2.0m)	(11-17m)	(7.0m)	(12-17m)	(10-16m)
August 7,8	Max.	22*	22*	23*	21*	22	23	24	19	19	19	19
	(depth)	(surf.)	(0.3m)	(surf.)	(0.3m)	(0.3m)	(surf.)	(surf.)	(surf.)	(surf.)	(surf.)	(0-5m)
	Min.	21	19	22	18	16	19	24	15	17	15	15
	(depth)	(3-6m)	(6-8m)	(1-2m)	(5-7m)	(8-9m)	(7-9m)	(2.0m)	(13-14m)	(5-7m)	(14-16m)	(15-16m)
October 17 (No Results Available)												
October 23 (No Results Available)												

* denotes August 7 results

(PWQO), maximum and minimum concentrations, as well as median concentrations, and sample means (where applicable) is included in Appendix B (Tables B1 to B15). Appendix C provides the complete data listing for all parameters summarized in Table 4.

Results of sampling for all organochlorines, chlorobenzenes, organo-phosphorus compounds, and phenoxy acids have been listed (Table 5) for those compounds with results greater than the MMA.

3.2.1 Physical Parameters - Water

The greatest suspended solids concentrations (Table B1) were detected in the northeast corner of the Inner Harbour near the dredging activity (Stn. 2017) and at the mouth of the Don River (Stn. 1379), as well as near the lakefilling operation (Stn. 1987), with median values 14 to 19 times greater than the open lake background median of 1.4 mg litre^{-1}. The greatest range (76.9 mg litre^{-1}) was observed near the lakefilling (Stn. 1987).

A similar pattern was evident for turbidity (Table B2), although the lower Don River (Stn. 2020) also exhibited levels in the same range as the northeast harbour sites (Stns. 2017, 1379), and the lakefilling site (Stn. 1987), with median values from 9 to 17 times greater than the open lake background median of 1.4 FTU. The maximum range (50.2 FTU) was observed near the lakefilling.

Results for conductivity (Table B3) show the most extreme values to have occurred in the lower Don River (Stn. 2020) with a median of 906 us cm^{-1}, and at the mouth of the Don River (Stn. 1379) with a median of 751 us cm^{-1}, as compared with the open lake background of 319 us cm^{-1}. Station 1379 exhibited the greatest range and variability. Median results in excess of 400 uS cm^{-1} were observed in the vicinity of both the Humber and Main STPs (Stns. 2072 and 1419), as well as near the dredge site (Stn. 2017), and at the mouth of the Humber River (Stn. 9053). The maximum range (517 uS cm^{-1}) occurred at the mouth of the Don River (Stn. 1379).

TABLE 4 : TORONTO WATER QUALITY 1985 --- MAXIMUM AND MINIMUM CONCENTRATIONS OF PHYSICAL PARAMETERS, NUTRIENTS AND TRACE METALS

PARAMETER:	SUSPENDED SOL. mg/l		TURBIDITY FTU		CONDUCTIV uS/cm		TOTAL P ug/l		TOTAL N ug/l		DISS. ORG CARB mg/l		ARSENIC ug/l		CADMIUM ug/l		COPPER ug/l		CHROMIUM ug/l		IRON ug/l		MERCURY FILT.ug/l		NICKEL ug/l		LEAD ug/l		ZINC ug/l	
PWQO:	---		---		---		20*		---		---		100		0.2		5		100		300		0.2		25		25**		30	
	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.
STATIONS																																
2054 Mimico Cr.	5.3	1.9	7.8	1.6	382	334	62	19	1420	540	2.7	2.1	1	ND	0.7	ND	7	1	5	1	340	69	0.07	ND	14	2	7	ND	50	4
2072 Humber STP	17.8	4.0	12.4	2.2	518	325	395	140	4950	340	4.4	2.7	1	ND	0.8	ND	20	5	18	3	970	80	0.04	ND	30	2	4	ND	80	3
9053 Humber R.	17.4	2.1	23.0	2.3	444	356	116	12	1730	260	3.1	2.3	1	ND	0.3	ND	7	1	9	ND	1400	42	0.03	ND	6	ND	6	ND	16	1
1536 Island FP.	1.7	0.2	4.2	0.5	329	318	26	7	410	190	2.3	2.0	1	ND	ND	ND	5	1	3	ND	44	6	0.01	ND	3	ND	8	ND	3	ND
1364 Harbour	12.3	2.2	11.8	2.4	360	338	48	12	490	220	2.4	2.0	1	ND	ND	ND	35	1	15	ND	260	63	ND	ND	2	ND	4	ND	16	2
2017 Dredging	34.0	12.4	31.0	14.1	467	413	98	66	1770	650	2.7	2.4	ND	ND	0.2	ND	10	4	12	2	1070	480	0.02	ND	3	2	13	7	18	12
1379 Cherry St.	39.7	15.2	45.0	9.1	906	394	205	65	2170	530	5.8	2.4	1	ND	0.5	ND	15	3	21	2	1200	520	0.02	ND	7	2	18	8	28	12
2020 Lower Don	36.1	6.0	38.0	7.3	1013	792	260	147	2300	1070	5.8	3.6	ND	ND	0.2	ND	41	6	29	3	1200	350	0.01	ND	14	ND	14	ND	34	16
1987 Lakefill	83.4	6.5	56.0	5.8	346	319	59	13	900	210	2.3	1.9	1	ND	ND	ND	7	2	3	1	4300	130	0.02	ND	4	ND	93	ND	22	3
1419 Main STP	26.3	2.9	25.0	1.1	526	401	1080	73	8750	1610	7.0	4.0	1	ND	0.4	ND	33	3	49	3	1400	100	0.02	ND	13	4	15	ND	100	5
2029 Harris FP.	4.8	0.2	2.9	1.1	326	318	18	7	420	210	2.1	1.9	2	ND	ND	ND	4	1	4	ND	28	8	0.02	ND	2	ND	7	ND	4	ND
1997 Control	1.8	0.2	3.6	0.8	326	317	21	7	340	170	2.3	1.9	1	ND	0.3	ND	6	1	2	ND	22	6	0.01	ND	2	ND	6	ND	5	ND

"* " INDICATES GUIDELINE ONLY
"**" INDICATES VARIABLE OBJECTIVE
"ND" INDICATES NOT DETECTED

3.2.2 Nutrients - Water

Maximum concentrations of total phosphorus (TP) (Table B4) were observed in the vicinity of the Main STP (Stn. 1419), the Humber STP (Stn. 2072), and the Don River (Stns. 2020 and 1379), with respective median concentrations of 144 ug litre^{-1}, 229 ug litre^{-1}, 157 ug litre^{-1}, and 140 ug litre^{-1}. The open lake background value was 12 ug litre^{-1}. The greatest range (1,007 ug litre^{-1}) was detected near the Main STP discharge (Stn. 1419). Median concentrations less than the Provincial guideline of 20 ug litre^{-1} (to avoid nuisance concentrations of algae) were detected only at the Toronto Island and R.C. Harris filtration plant intakes (Stns. 1536 and 2029) and at the open lake background station (Stn. 1997). Only station 2029 had all observations less than 20 ug litre^{-1}.

Results for total Kjeldahl nitrogen (TKN) (Table B5) showed the maximum median of 5,250 ug litre-1 (20 times greater than the open lake background of 255 ug litre^{-1}) to have occurred near the Main STP discharge (Stn. 1419). Levels in the lower Don River (Stn. 2020) and near the Humber STP discharge (Stn. 2072) were approximately eight times the open lake background. The maximum range (7,140 ug litre^{-1}) was recorded near the Main STP discharge (Stn. 1419).

For dissolved organic carbon (DOC) (Table B6), maximum median concentrations were observed in the lower Don River (Stn. 2020) and near the Main STP discharge (Stn. 1419) with values of 5.2 mg litre^{-1} and 5.1 mg litre^{-1}, respectively. The median open lake background was 2.0 mg litre^{-1}. The greatest range (3.4 mg litre^{-1}) occurred at the mouth of the Don River (Stn. 1379).

3.2.3 Trace Metals - Water

Trace metals analysis included: arsenic, cadmium, copper, chromium, iron, mercury (filtered), nickel, lead and zinc.

Arsenic results (Table B7) show concentrations at all stations to have been at or below the MMA of 1 ug litre^{-1}. Results for cadmium (Table B8) show a similar pattern with values close to the MMA of 0.2 ug litre^{-1}. However, since this is also the PWQO, several stations had one or more observations greater than the PWQO. These were: the mouth of Mimico Creek (Stn. 2054), the Humber STP discharge (Stn. 2072), the mouth of the Humber River (Stn. 9053), the mouth of the Don River (Stn. 1379), the Main STP discharge (Stn. 1419) and the open lake background (Stn. 1997).

Greatest copper concentrations (Table B9) were observed near the Humber STP (Stn. 2072) and in the lower Don (Stn. 2020) with median values of 8 ug litre^{-1}, four times greater than the open lake background median of 2 ug litre^{-1}. Median values at the dredge site (Stn. 2017), the mouth of the Don River (1379), and the Main STP discharge (Stn. 1419) were slightly less, but were also recorded to be greater than the PWQO of 5 ug litre^{-1}. Only the filtration plant intake stations (Stns. 1536, 2029) had no observations in excess of the objective. The greatest ranges were measured in the lower Don River (35 ug litre^{-1}), the middle of the Inner Harbour (Stn. 1364) (34 ug litre^{-1}), and the Main STP (30 ug litre^{-1}).

The greatest median chromium concentration (Table B10) was observed in the lower Don River (Stn. 2020) with a value of 9 ug litre^{-1} compared with 1 ug litre^{-1} at the open lake background station. Median concentrations of greater than four times the open lake background were detected at the Humber STP discharge (8 ug litre^{-1}), the dredge site (7 ug litre^{-1}), the Main STP discharge (6 ug litre^{-1}), and the mouth of the Don River (5 ug litre^{-1}). The greatest range was observed at the Main STP discharge with a value of 460 ug litre^{-1}. No observation at any station exceeded the PWQO of 100 ug litre^{-1}.

Iron results (Table B11) show the greatest medians at the mouth of the Don River (Stn. 1379), near the dredge site (Stn. 2017), and near the lakefilling site (Stn. 1987) with values of 895 ug litre^{-1}, 760 ug litre^{-1}, and 700 ug litre^{-1}, respectively, compared with 14 ug litre^{-1} at the open lake background station. Other stations with median concentrations greater than the PWQO of 300 ug litre^{-1} were the Humber STP (Stn. 2072) and the lower Don River (Stn. 2020) with corresponding values of 535 ug litre^{-1} and 480 ug litre^{-1}. The lakefilling site (Stn. 1987) exhibited the greatest range (4,170 ug litre^{-1}).

Results for filtered mercury (Table B12) were similar to arsenic and cadmium in that most observations were near or below the MMA of 0.01 ug litre^{-1}. There were no results greater than the PWQO of 0.20 ug litre^{-1}.

Maximum nickel concentrations (Table B13) were recorded at the Humber STP discharge (Stn. 2071) with a median value of 22 ug litre^{-1} compared with an open lake background of less than the MMA of 1 ug litre^{-1}. The Humber STP discharge was the only station to record any concentrations greater than the PWQO of 25 ug litre^{-1} (in 33% of the samples), and also exhibited the greatest range (28 ug litre^{-1}).

Maximum median concentrations of lead (Table B14) were recorded at the mouth of the Don River (Stn. 1379) and near the dredge site (Stn. 2017) with corresponding values of 15 ug litre^{-1} and 12 ug litre^{-1}. The open lake background was less than the MMA of 3 ug litre^{-1}. The lakefilling station (Stn. 1987) had the greatest range (approximately 90 ug litre^{-1}) and was the only station where concentrations greater than the PWQO were found (in 20% of the samples).

Zinc concentrations (Table B15) were observed to be greatest near the Humber STP discharge with a median value of 30 ug litre^{-1}, compared with 2 ug litre^{-1} at the open lake background. Median levels of 23 ug $litre^{-1}$ and 20 ug $litre^{-1}$ were recorded at the mouth of the Don River (Stn. 1379), and in the lower Don River (Stn. 2020), respectively. Although no medians exceeded the PWQO, single observations greater than the PWQO were made at the mouth of Mimico Creek (Stn. 2054), near the Humber STP discharge (Stn. 2072), in the lower Don River (Stn. 2020), at the Main STP discharge (Stn. 1419), and near the lakefilling (Stn. 1987). This latter station exhibited the greatest range (217 ug $litre^{-1}$).

3.2.4 Trace Organics - Water

Forty-eight organochlorine, chlorobenzene, chlorophenol, and phenoxy acid compounds were included in the requested organics scans for water quality analysis (Appendix A). Of these, 27 were detected at one or more stations, on at least one occasion. In most instances, compounds were detected at concentrations near their respective minimum measurable amounts, and consequently, values must be interpreted with caution (i.e. these results indicate that the compound was detected, but the listed concentration must be considered tentative).

Table 5 lists all results for those compounds detected at least once at each station. These indicate that the greatest number of compounds were detected at the mouth of the Don River (Stn. 1379) where 18 different trace organics were detected. Of these gamma-BHC (lindane) and 1,2,3,4-tetrachlorobenzene occurred most frequently (i.e. in 8 of 10, and 7 of 10 samples, respectively). Concentrations in excess of the PWQO were observed for gamma-BHC (10 ng $litre^{-1}$), heptachlor plus heptachlor epoxide (1 ng $litre^{-1}$), aldrin plus dieldrin (1 ng $litre^{-1}$), and pentachlorophenol (500 ng $litre^{-1}$). Pentachlorophenol data must be viewed with additional caution, since foil-coated cardboard cap liners were used with sample containers, rather than the preferred teflon cap liners, and these have been linked to sample contamination.

TABLE 5: Trace Organics (ng/litre) Replicate Sampling Results - 1985 Toronto Water Quality

			Sampling Dates											
Compounds Detected	MMA	PWQO	April 23		May 29		July 17		August 7		October 17		October 23	
Station 2054: Mouth of Mimico Creek														
alpha - BHC	1 ng/L	-	3	3	nd	nd	nd	nd	nd	nd	-3	3	1	1
beta - BHC	1 ng/L	-	nd	nd	nd	nd	nd	nd	nd	nd	2	nd	nd	nd
gamma - BHC	1 ng/L	10 ng/L	3	nd	nd	nd	nd	nd	nd	nd	3	5	3	3
1,2,4-trichlorobenzene	5 ng/L	500 ng/L	nd	nd	nd	nd	nd	nd	nd	nd	nd	8	nd	nd
hexachlorobenzene	1 ng/L	6.5 ng/L	nd	nd	nd	nd	nd	nd	nd	nd	4	4	2	2
octachlorostyrene	1 ng/L	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1
Station 2072: Humber STP Outfall														
alpha - BHC	1 ng/L	-	nd	4	nd	nd	nd	nd	nd	nd	3	2	1	nd
gamma - BHC (lindane)	1 ng/L	10 ng/L	nd	4	nd	3	nd	nd	nd	nd	6	nd	4	3
1,2,3,4-tetrachlorobenzene	1 ng/L	100 ng/L	nd	nd	nd	3	nd	nd	nd	nd	nd	nd	nd	nd
1,2,4,5-tetrachlorobenzene	1 ng/L	150 ng/L	nd	nd	2	11	nd	nd	nd	nd	nd	nd	nd	nd
hexachlorobenzene	1 ng/L	6.5 ng/L	nd	nd	nd	nd	nd	nd	nd	nd	4	2	1	nd
hexachloroethane	1 ng/L	-	nd	1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
pentachlorophenol	50 ng/L	500 ng/L	nd	nd	nd	nd	60	nd	nd	nd	nd	nd	nd	-
Station 9053: Mouth of Humber River														
alpha - BHC	1 ng/L	-	3	4	nd	nd	nd	nd	nd	nd	2	nd	nd	1
beta - BHC	1 ng/L	-	2	2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
gamma - BHC (lindane)	1 ng/L	10 ng/L	2	2	1	nd	nd	nd	nd	nd	1	1	1	nd
heptachlor	1 ng/L	1 ng/L	nd	nd	nd	nd	nd	nd	nd	nd	nd	1	nd	nd
hexachlorobenzene	1 ng/L	6.5 ng/L	nd	nd	nd	nd	nd	nd	nd	nd	2	2	1	1
octachlorostyrene	1 ng/L	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	2	nd	nd

			Sampling Dates											
Compounds Detected	MMA	PWQO	April 23		May 29		July 17		August 7, 8*		October 17		October 23	
Station 1536: Island Filtration Plant Intake														
alpha - BHC	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	1	nd	1	1
beta - BHC	1 mg/L	-	-	-	1	nd	nd	nd	nd	nd	nd	nd	nd	nd
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	nd	nd	2	2	2	1
octachlorostyrene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	nd	nd	1	1	nd	nd
pentachlorophenol	50 ng/L	500 ng/L	-	-	nd	nd	nd	nd	nd	nd	50	343	nd	nd
***Station 1364: Inner Harbour Background**														
alpha - BHC	1 ng/L	-	-	-	nd	1	nd	nd	nd	nd	1	2	1	1
gamma - BHC (lindane)	1 ng/L	10 ng/L	-	-	2	2	nd	nd	nd	nd	nd	2	nd	nd
heptachlor epoxide	1 ng/L	1 ng/L	-	-	nd	1	nd	nd	nd	nd	1	2	nd	1
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	nd	nd	1	1	2	1
***Station 2017: At Dredge Site**														
alpha - BHC	1 ng/L	-	-	-	3	nd	-	-	nd	nd	-	-	-	-
gamma - BHC (lindane)	1 ng/L	10 ng/L	-	-	5	3	-	-	nd	nd	-	-	-	-
heptachlor epoxide	1 ng/L	1 ng/L	-	-	nd	1	-	-	nd	nd	-	-	-	-
1,2,4,5 tetrachlorobenzene	1 ng/L	150 ng/L	-	-	nd	9	-	-	nd	nd	-	-	-	-
pentachlorobenzene	1 ng/L	30 ng/L	-	-	2	nd	-	-	nd	nd	-	-	-	-

TABLE 5: Trace Organics (ng/litre) Replicate Sampling Results - 1985 Toronto Water Quality.

Compounds Detected	MMA	PWQO	Sampling Dates											
			April 23		May 29		July 17		August 8		October 17		October 23	
Station 1379: Mouth of Don River at Cherry St. Bridge														
alpha - BHC	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	1
gamma - BHC	1 ng/L	10 ng/L	-	-	3	2	nd	nd	7	7	5	5	56	89
heptachlor	1 ng/L	1 ng/L	-	-	2	nd	nd	nd	nd	nd	nd	nd	nd	nd
heptachlor epoxide	1 ng/L	1 ng/L	-	-	4	1	nd	nd	nd	nd	nd	nd	nd	nd
aldrin	1 ng/L	1 ng/L	-	-	3	nd	nd	nd	nd	4	nd	nd	nd	nd
dieldrin	1 ng/L	1 ng/L	-	-	8	nd	nd	nd	6	7	nd	nd	3	4
endosulphan II	4 ng/L	3 ng/L	-	-	4	nd	nd	nd	nd	nd	nd	nd	nd	nd
endosulphan sulphate	4 ng/L	-	-	-	4	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,4,5 trichlorotoluene	5 ng/L	-	-	-	nd	8	nd	nd	nd	nd	nd	nd	nd	nd
1,2,3 trichlorobenzene	5 ng/L	900 ng/L	-	-	nd	nd	nd	nd	8	12	nd	nd	nd	nd
1,2,3,4 tetrachloro-benzene	1 ng/L	100 ng/L	-	-	6	nd	nd	nd	11	14	2	2	2	3
1,2,4,5 tetrachloro-benzene	1 ng/L	150 ng/L	-	-	nd	2	nd	nd	nd	nd	nd	nd	nd	nd
pentachlorobenzene	1 ng/L	30 ng/L	-	-	nd	nd	nd	nd	8	9	2	2	2	3
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	3	3	nd	nd	1	2
octachlorostyrene	1 ng/L	-	-	-	nd	nd	nd	nd	2	nd	nd	nd	2	3
pentachlorophenol	50 ng/L	500 ng/L	-	-	nd	nd	nd	60	nd	nd	103	580	842	-
2,4 - DB	100 ng/L	4x10^{3}ng/L	-	-	-	-	nd	nd	190	228	163	nd	nd	-
2,4 - DP	100 ng/L	-	-	-	-	-	nd	nd	nd	103	nd	nd	nd	-

Compounds Detected	MMA	PWQO	Sampling Dates											
			April 23		May 29		July 17		August 8		October 17		October 23	
Station 2020: Lower Don River														
alpha - BHC	1 ng/L	-	-	-	nd	nd	4	2	nd	nd	-	-	nd	nd
gamma - BHC (lindane)	1 ng/L	10 ng/L	-	-	4	8	14	9	7	8	-	-	42	nd
alpha-chlordane	2 ng/L	60 ng/L	-	-	nd	2	nd	nd	nd	nd	-	-	nd	nd
heptachlor	1 ng/L	1 ng/L	-	-	nd	nd	nd	nd	nd	nd	-	-	nd	7
heptachlor epoxide	1 ng/L	1 ng/L	-	-	2	nd	nd	nd	nd	nd	-	-	nd	nd
dieldrin	1 ng/L	1 ng/L	-	-	nd	2	nd	nd	nd	nd	-	-	3	nd
1,2,3,4 tetrachloro-benzene	1 ng/L	100 ng/L	-	-	nd	nd	5	5	nd	nd	-	-	3	7
pentachlorobenzene	1 ng/L	30 ng/L	-	-	nd	nd	nd	nd	nd	nd	-	-	3	1
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	2	2	-	-	3	1
pentachlorophenol	50 ng/L	500 ng/L	-	-	nd	nd	60	100	144	120	-	-	-	-
dicamba	100 ng/L	2x10^{5}ng/L	-	-	-	-	140	160	nd	nd	-	-	-	-
2,4 - DB	100 ng/L	4x10^{3}ng/L	-	-	-	-	160	300	nd	258	-	-	-	-

TABLE 5: Trace Organics (ng/litre) Replicate Sampling Results - 1985 Toronto Water Quality

Compounds Detected	MMA	PWQO	Sampling Dates											
			April 23		May 29		July 17		August 8		October 17		October 23	
Station 1987: At lakefilling Site														
alpha - BHC	1 ng/L	-	-	-	nd	2	nd	nd	nd	nd	nd	nd	1	nd
alpha - chlordane	2 ng/L	60 ng/L	-	-	nd	nd	nd	nd	5	6	5	nd	nd	nd
gamma - chlordane	2 ng/L	60 ng/L	-	-	nd	nd	nd	nd	4	5	5	nd	nd	nd
aldrin	1 ng/L	1 ng/L	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	1
p,p - DDT	5 ng/L	3 ng/L	-	-	nd	nd	nd	nd	nd	nd	nd	nd	5	nd
1,2,4,5 tetrachloro-benzene	1 ng/L	150 ng/L	-	-	nd	7	nd	nd	nd	nd	nd	nd	nd	nd
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	nd	nd	2	nd	2	1
octachlorostyrene	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	2	nd	nd	nd
Station 1419: Main STP Outfall														
alpha - BHC	1 ng/L	-	-	-	nd	nd	4	4	nd	nd	3	3	3	nd
gamma - BHC	1 ng/L	10 ng/L	-	-	2	3	4	5	5	6	9	8	7	3
heptachlor	1 ng/L	1 ng/L	-	-	nd	nd	nd	nd	2	nd	nd	nd	nd	nd
heptachlor epoxide	1 ng/L	1 ng/L	-	-	1	1	nd	nd	nd	nd	nd	nd	nd	nd
2,3,6-trichlorotoluene	5 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,2,3-trichlorobenzene	5 ng/L	900 ng/L	-	-	nd	5	26	27	20	35	nd	nd	nd	nd
1,2,4-trichlorobenzene	5 ng/L	500 ng/L	-	-	nd	nd	nd	nd	70	77	nd	nd	30	nd
1,2,3,4-tetrachloro-benzene	1 ng/L	100 ng/L	-	-	6	nd	nd	nd	16	23	17	13	10	3
pentachlorobenzene	1 ng/L	30 ng/L	-	-	3	nd	nd	nd	8	12	6	5	4	1
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	1	5	6	3	3	4	3	2	1
octachlorostyrene	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	2	1
pentachlorophenol	50 ng/L	500 ng/L	-	-	nd	nd	285	230	80	140	150	72	-	-

Compounds Detected	MMA	PWQO	Sampling Dates											
			April 23		May 29		July 17		August 7		October 17		October 23	
Station 2029: R.C. Harris Filtration														
alpha - BHC	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	1	-	1	-
1,2,3,4 tetrachloro-benzene	1 ng/L	100 ng/L	-	-	nd	5	nd	nd	nd	nd	nd	-	nd	nd
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	nd	nd	2	-	1	2
octachlorostyrene	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	1	-	nd	1
pentachlorophenol	50 ng/L	500 ng/L	-	-	nd	nd	nd	nd	nd	nd	nd	117	-	-
2,4 - DB	100 ng/L	4×10^3ng/L	-	-	-	nd	nd	nd	nd	nd	nd	157	-	-
Station 1997: Control Station 1 km NE of 2029														
alpha - BHC	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	1
gamma - BHC (lindane)	1 ng/L	10 ng/L	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	1
hexachlorobenzene	1 ng/L	6.5 ng/L	-	-	nd	nd	nd	nd	nd	nd	nd	nd	2	3
octachlorostyrene	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	1	nd
hexachlorobutadiene	1 ng/L	-	-	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	1

"-" indicates no result available
"nd" indicates not detected

The stations with the next fewest number of compounds detected, were the lower Don River (Stn. 2020), and the Main STP discharge (Stn. 1419) both with 12 different trace organics (Table 5). Organochlorine compounds predominated at the former, while chlorobenzene compounds were most prevalent at the latter. Only gamma-BHC (lindane) was detected in excess of the PWQO in the lower Don River, and no compounds were observed in excess of existing PWQO at the Main STP discharge.

The Inner Harbour background station had the fewest number of detected trace organics with only four compounds. This station and the lakefilling site (Stn. 1987) were the only locations removed from the Don River to have compounds detected above the PWQO, with heptachlor epoxide occurring at the Inner Harbour station, and p,p-DDT occurring at the lakefilling site.

Five trace organics were detected at the open lake background station (Stn. 1997), the same number as at the dredge site (Stn. 2017) and the Island filtration plant (Stn. 1536). Six compounds were detected at the mouths of Mimico Creek and the Humber River (Stns. 2054, 9053), and at the R.C. Harris filtration plant intakes (Stn. 2029), while seven were detected at the Humber STP discharge (Stn. 2072) and eight at the lakefilling site (Stn. 1987).

3.3 Suspended Sediment Sampling

Results of centrifuge suspended sediment sampling at the six "input" stations have been summarized for nutrients, metals, and physical parameters (Table 6), as well as for those organochlorine compounds detected at least once, at one or more stations (Table 7). Composite water sample results from the pre-centrifuge stream have been included in Appendix C.

TABLE 6: CENTRIFUGE SUSPENDED SEDIMENT -- NUTRIENTS, METALS, PHYSICAL PARAMETERS

STATION	DATE ddmmyy	%loss	Fe mg/g	Mn ug/g	TP mg/g	TKN mg/g	Al mg/g	As ug/g	Cd ug/g	Cr ug/g	Cu ug/g	Hg ug/g	Ni ug/g	Pb ug/g	TOC mg/g	Zn mg/g	Sxt mg/g
HUMBER STP	250485	-	100.00	320.00	-	-	6.10	9.11	19.00	540.00	410.00	0.36	100.00	150.00	-	1.60	34.90
	20585	53.50	100.00	300.00	49.70	46.70	3.10	4.54	30.00	560.00	420.00	0.58	110.00	120.00	-	2.00	30.19
	270685	69.40	-	-	23.93	46.70	-	3.84	-	-	-	0.78	-	-	360.00	-	124.02
	171085	-	73.00	160.00	28.82	36.80	3.30	4.41	31.00	70.00	470.00	-	93.00	140.00	-	1.70	65.20
	211085	-	86.00	200.00	30.00	41.40	5.00	5.93	110.00	1200.00	50.00	0.74	220.00	270.00	300.00	3.10	83.84
MAIN STP	240485	36.30	90.00	420.00	48.00	29.30	31.00	11.51	140.00	2200.00	1800.00	0.71	320.00	940.00	190.00	3.60	103.34
	10585	-	84.00	380.00	44.80	30.40	27.00	12.10	99.00	2200.00	1700.00	1.80	190.00	870.00	-	3.40	94.63
	10685	-	45.00	270.00	-	-	16.00	7.20	68.00	1700.00	1300.00	-	110.00	510.00	-	2.30	112.12
	280685	-	67.00	410.00	56.57	15.60	37.00	12.32	130.00	2400.00	2200.00	-	170.00	860.00	120.00	3.50	63.84
	181085	61.00	35.00	200.00	32.00	40.00	16.00	8.16	89.00	2000.00	1300.00	2.00	130.00	440.00	310.00	2.90	57.93
	221085	36.00	59.00	350.00	50.35	33.60	32.00	11.60	170.00	2600.00	1900.00	0.92	180.00	750.00	200.00	3.60	83.48
MIMICO CREEK	220485	8.40	30.00	720.00	1.60	3.30	21.00	11.27	4.00	94.00	150.00	0.10	36.00	280.00	34.00	0.60	21.94
	40585	9.10	32.00	690.00	1.70	3.70	23.00	13.00	3.30	130.00	160.00	0.22	36.00	290.00	54.00	0.61	19.68
	10685	-	31.00	690.00	2.60	6.60	21.00	12.34	4.10	140.00	170.00	0.23	35.00	280.00	-	0.59	20.81
	240685	9.80	-	-	2.24	5.60	-	1.83	-	-	-	-	-	-	-	-	20.52
	191085	10.00	30.00	120.00	1.79	3.80	25.00	9.84	5.00	160.00	130.00	0.16	37.00	310.00	55.00	0.87	18.43
	231085	13.00	29.00	740.00	2.45	6.00	21.00	10.40	6.50	170.00	230.00	0.19	40.00	290.00	72.00	0.76	26.84
LAKEFILL	60585	8.00	28.00	540.00	1.90	4.30	21.00	11.70	1.80	74.00	98.00	0.34	27.00	120.00	-	0.23	10.32
	70585	-	23.00	500.00	-	-	18.00	13.00	1.40	53.00	83.00	NA	25.00	85.00	-	0.20	26.39
	241085	9.80	18.00	460.00	1.67	7.10	12.00	6.17	1.30	58.00	60.00	0.12	26.00	82.00	53.00	0.17	10.55
	41285	4.00	31.00	610.00	1.10	1.60	25.00	6.74	0.20	60.00	48.00	0.14	33.00	54.00	13.00	0.17	1.44
	61285	6.20	27.00	670.00	1.39	1.30	22.00	8.34	1.40	50.00	89.00	10.00	28.00	200.00	26.00	0.43	2.91
	91285	4.60	21.00	530.00	1.22	9.90	16.00	6.48	0.59	43.00	65.00	1.80	29.00	71.00	23.00	0.19	3.09
DON RIVER	30585	11.30	27.00	610.00	2.90	8.30	18.00	5.40	2.70	100.00	170.00	0.40	27.00	290.00	64.00	0.50	20.82
	40585	9.70	28.00	640.00	2.50	3.70	19.00	8.54	2.30	100.00	220.00	0.39	28.00	230.00	-	0.45	25.25
	10685	8.80	28.00	790.00	2.90	5.10	20.00	6.80	1.50	91.00	110.00	0.17	30.00	200.00	-	0.35	13.36
	280685	6.30	36.00	790.00	3.18	3.60	20.00	7.36	2.90	170.00	110.00	0.12	36.00	190.00	43.87	0.35	15.99
	191085	8.60	23.00	870.00	1.52	3.10	17.00	4.48	2.00	63.00	98.00	0.21	25.00	240.00	47.00	0.41	12.02
	221085	13.00	30.00	800.00	3.69	5.60	19.00	6.72	3.40	120.00	160.00	0.33	30.00	230.00	71.00	0.52	17.13
HUMBER RIVER	230485	6.40	27.00	910.00	1.30	3.90	18.00	5.96	1.40	46.00	62.00	0.08	24.00	170.00	26.00	0.23	8.07
	40585	5.10	24.00	730.00	1.90	2.80	17.00	3.41	1.40	60.00	65.00	0.12	20.00	88.00	27.00	0.20	7.43
	10685	4.10	31.00	740.00	1.10	1.70	25.00	6.88	0.54	53.00	60.00	0.06	26.00	63.00	17.00	0.15	2.69
	270685	6.30	34.00	1100.00	1.55	3.20	27.00	4.63	1.30	88.00	71.00	0.07	32.00	93.00	31.00	0.19	5.20
	191085	8.20	23.00	790.00	1.55	3.50	17.00	5.70	2.40	69.00	100.00	0.21	26.00	200.00	46.00	0.35	12.22
	231085	9.60	26.00	1700.00	1.53	4.30	20.00	6.80	2.30	86.00	91.00	0.12	29.00	110.00	50.00	0.29	10.04

TABLE 7: CENTRIFUGE SUSPENDED SEDIMENT -- ORGANOCHLORINE COMPOUNDS (ng/g)

STATION	DATE ddmmyy	PCB	HCB	alpha BHC	beta BHC	gamma BHC	alpha chlrdane	gamma chlrdane	Oxy chlrdane	pp-DDT	pp-DDE	pp-DDD	op-DDT	DMDT	Endosulf I	Endosulf II	Endslfn sulphate	Dieldrin	Endrin	Heptchlor epoxide	Mirex
HUMBER	250485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STP	20585	215	10	ND	ND	ND	ND	8	ND	ND	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	270685	220	ND	ND	ND	ND	ND	ND	20	ND	6	ND	ND	ND	ND	ND	ND	160	ND	20	ND
	171085	65	3	ND	1	ND	ND	ND	ND	ND	12	ND	ND	170	ND	ND	ND	ND	10	ND	ND
	211085	355	9	ND	ND	ND	22	13	ND	30	35	ND	ND	14	ND	ND	29	ND	9	ND	ND
MAIN	240485	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STP	10585	375	89	ND	ND	ND	7	9	9	ND	5	ND	ND	34	52	ND	ND	37	ND	ND	ND
	10685	340	65	ND	ND	ND	20	15	ND	ND	24	20	ND	ND	44	ND	89	97	65	ND	ND
	280685	185	37	1	1	1	ND	ND	ND	ND	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	181085	650	83	ND	ND	ND	ND	ND	ND	ND	33	ND	ND	250	ND	ND	44	42	55	35	ND
	221085	870	74	ND	ND	ND	9	9	ND	ND	55	10	ND	81	32	ND	27	36	34	29	ND
MIMICO	220485	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CREEK	40585	515	7	ND	ND	ND	ND	ND	ND	10	20	25	ND	ND	ND	8	10	4	ND	ND	ND
	10685	300	4	17	ND	ND	33	35	ND	10	19	15	ND	ND	44	ND	14	14	ND	1	ND
	240685	365	3	ND	ND	ND	ND	ND	10	ND	23	ND	ND	ND	ND	ND	ND	15	ND	35	ND
	191085	325	ND	ND	ND	ND	12	10	ND	10	9	ND	ND	12	8	ND	6	5	13	8	ND
	231085	360	2	ND	ND	ND	9	9	ND	ND	23	10	ND	44	12	ND	8	12	24	15	ND
LAKEFILL	60585	290	2	ND	ND	ND	20	20	ND	15	15	7	ND	ND	ND	ND	ND	110	4	ND	ND
	70585	75	1	ND	ND	ND	10	10	ND	5	7	10	ND	ND	ND	ND	ND	15	ND	ND	ND
	241085	225	ND	ND	ND	ND	3	3	ND	ND	10	ND	ND	91	32	ND	12	4	14	32	ND
	41285	110	3	ND	ND	ND	3	3	ND	ND	17	ND	ND	-	-	-	-	-	-	-	ND
	61285	260	2	ND	ND	ND	6	5	ND	60	19	10	10	ND	ND	ND	ND	ND	ND	ND	ND
	91285	40	2	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DON	30585	400	5	ND	ND	3	19	24	ND	10	9	20	ND	197	ND	4	32	21	ND	ND	ND
RIVER	40585	140	ND	5	ND	15	14	15	ND	6	7	15	ND	ND	ND	ND	ND	ND	4	20	ND
	10685	290	27	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	280685	110	2	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	191085	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	221085	ND	ND	ND	ND	ND	11	14	ND	5	88	25	ND	86	16	ND	6	115	30	20	ND
HUMBER	230485	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RIVER	40585	230	1	ND	ND	ND	7	8	ND	5	12	25	ND	ND	ND	ND	ND	5	ND	5	ND
	10685	60	ND	ND	ND	ND	2	2	ND	ND	3	ND	ND	ND	ND	ND	ND	4	ND	ND	ND
	270685	90	1	ND	ND	ND	ND	ND	ND	ND	6	ND	ND	10	ND	ND	ND	5	ND	2	ND
	191085	245	ND	ND	ND	ND	9	10	ND	10	13	15	ND	111	28	10	16	9	15	20	5
	231085	160	ND	ND	ND	ND	3	8	ND	ND	8	10	ND	23	12	ND	19	ND	8	13	ND

3.3.1 Physical Parameters - Suspended Sediment

The greatest median result for percentage loss on ignition (% LOI) was observed at the Humber STP in-plant site (Stn. 3-0018) with a value of approximately 61%. This was an order of magnitude greater than the minimum result of 6.2% observed near the lakefilling site (Stn. 1987). A similar pattern occurred for total organic carbon (TOC), with a maximum median of 330 mg g^{-1} at the Humber STP, and a minimum of 25 mg g^{-1} near the lakefilling.

Measurements for oil and grease (solvent extractables) show the greatest concentrations to have occurred at the Main STP in-plant site (Stn. 3-0022) with a median value of 89.1 mg g^{-1}. Once again the lakefilling site (Stn. 1987) showed the minimum concentrations, with a median of 6.7 mg g^{-1}.

3.3.2 Nutrients - Suspended Sediment

Maximum concentrations of total phosphorus (TP) were recorded at the Main STP in-plant station (Stn. 3-0022) with a median concentration of 48 mg g^{-1}, compared with a minimum of 1.4 mg g^{-1} at the lakefilling site. The highest median concentration of total Kjeldahl nitrogen (TKN) was observed at the Humber STP in-plant site (Stn. 3-0018) with a value of 44.0 mg g^{-1}, more than ten times the minimum median result of 3.4 mg g^{-1} recorded at the mouth of the Humber River (Stn. 9053).

3.3.3 Trace Metals - Suspended Sediment

The pattern of maximum median concentrations at the Main STP in-plant site (Stn. 3-0022), and minimum median concentrations at the lakefilling site (Stn. 1987) was evident for cadmium (max. 115 ug g^{-1}, min. 1.4 ug g^{-1}), chromium (max. 2,200 ug g^{-1}, min. 56 ug g^{-1}), lead (max. 805 ug g^{-1}, min. 84 ug g^{-1}), and zinc (max. 3.50 mg g^{-1}, min. 0.20 mg g^{-1}).

Results for copper, mercury and nickel were similar in that maximum median values were recorded at the Main STP in-plant site (Stn. 3-0022) and minimum median values were recorded at the mouth of the Humber River (Stn. 9053) for all of them. Copper values ranged from 1,750 ug g^{-1} to 68 ug g^{-1}, mercury from 1.9 ug g^{-1} to 0.1 ug g^{-1}, and nickel from 175 ug g^{-1} to 26 ug g^{-1}.

Aluminum and arsenic were distinct in that in both cases the maximum median concentrations occurred at the Main STP (Stn. 3-0022), while the minimum occurred at the Humber STP (Stn. 3-0018). Aluminum medians ranged from 29 mg g^{-1} to 4.2 mg g^{-1}, while arsenic varied from 11.6 ug g^{-1} to 4.5 ug g^{-1}.

Results for iron show that the maximum median (93 mg g^{-1}) occurred at the Humber STP (Stn. 3-0018), with the minimum (25 mg g^{-1}) occurring at the lakefilling site (Stn. 1987).

Manganese results differed from all other parameters with the minimum median (250 ug g^{-1}) occurring at the Humber STP (Stn. 3-0018), and the maximum (850 ug g^{-1}) occurring at the mouth of the Humber River (Stn. 9053).

3.3.4 Trace Organics - Suspended Sediment

Of the 22 organochlorine compounds analyzed for (Appendix D), only two (heptachlor and aldrin) were not detected at least once at one or more stations. Two compounds (PCBs and p,p-DDE) were detected in every sample and in both cases maximum median concentrations were observed at the Main STP (Stn. 3-0022), (218 ng g^{-1} for PCB, and 24 ng g^{-1} for p,p-DDE). Minimum median concentrations were recorded at the mouth of the Humber River (Stn. 9053), (PCB: 138 ng g^{-1}, p,p-DDE: 8 ng g^{-1}).

4.0 DISCUSSION

4.1 Impact of Suspended Sediments on Water Quality

The general tendency for suspended sediments at the STPs to have exhibited greater concentrations of nutrients, metals and organochlorine compounds than at river mouths or near the lakefilling operation (based on comparison of medians and ranges), was paralleled by the physical parameters, % LOI, TOC, and oil and grease (solvent extractables) (Tables 6, 7). This may have resulted from direct adsorption of various contaminants by organic debris and colloidal material, or it may have been a reflection of the tendency for urban non-point sources (such as storm runoff) to contain elevated levels of organic debris, hydrocarbons, and inorganic forms of other contaminants. In this instance, however, the extreme concentrations of % LOI and oil/grease suggest that direct associations between contaminants and organic material (nutrients, metals) and oil/grease (PCBs) were most likely.

There were exceptions to the pattern of elevated contaminant concentrations at the STPs. Manganese displayed lower concentrations at the STPs than at the river or lakefilling stations which suggests that it was associated predominantly with inorganic constituents of the suspended sediments (if manganese data are normalized according to percentage inorganic material, then the difference between STP and other results is greatly diminished).

It is also evident that for several metals (Al, Cr, Cu, Pb) and one organochlorine compound (HCB), concentrations at the Main STP exceeded those at the Humber STP. This may have resulted from differences in the treatment operations (i.e. removal efficiency) or because of basic differences in the composition of untreated influent at the two plants.

Examination of results other than those at the STPs reveals a pattern of similar medians and overlapping ranges for % LOI, TP, TKN, aluminum, arsenic, mercury, oil/grease and organochlorine compounds. However, for iron, cadmium, chromium, copper, nickel, lead, zinc, and TOC, it is evident that results from Mimico Creek were higher than for the Don or Humber Rivers, or the lakefilling site.

These findings suggest that the greatest potential for water quality degradation from contaminants associated with suspended sediments occurred at the Main STP, followed by the Humber STP, then Mimico Creek, and finally the remaining river stations and lakefilling station. However, water quality measurements at these various locations can be expected to reflect not only the concentration of contaminants within the suspended sediments, but also the concentration of suspended sediments in the water sample, as well as a certain concentration associated with the aqueous phase.

Estimates of partitioning between aqueous and particulate phases of contaminants can be made by combining suspended sediment chemistry results with the concentration of suspended solids in water results for various parameters and comparing these with the corresponding water chemistry result. For example, if iron was measured at 100 mg g^{-1} in suspended sediment, and suspended sediment measured at 10 mg $litre^{-1}$ in a corresponding water sample, then a whole water concentration of 1.0 mg $litre^{-1}$ would result from the particulate phase alone. If the corresponding whole water sample was measured to have an iron concentration of 2.0 mg $litre^{-1}$, then one could estimate that this was 50% particulate, and 50% aqueous.

This exercise was attempted for those parameters with corresponding suspended sediment and water quality results. However, estimates were extremely variable with several instances where the predicted whole water concentration attributable to suspended sediment alone greatly exceeded the observed whole water concentration. These variable results identify the need for modification of the methodology for sampling from the pre-centrifuge stream since it is apparent that hourly composites did not always reflect the quality of water (or effluent) being centrifuged. This may have been attributable to short-term fluctuations resulting from operational changes at STP's, or slugs of poorly mixed water at the rivers and lakefilling sites. Continuous sampling, or separate analysis of grab samples would improve this situation.

Despite the generally inconclusive nature of the partitioning estimate procedure results for TKN, cadmium, and nickel showed some systematic behaviour. For TKN, the particulate percentage did not exceed 10% at the Humber STP or the Main STP, while maximum particulate percentages varied from 27% at the Humber River, to 59% at Mimico Creek. Nickel showed a similar pattern, with maximum particulate percentages of less than 10% at the Humber STP and the Main STP, compared with maximum results ranging from 36% at the Cherry St. bridge, to 96% at the Humber River. The opposite trend was visible for cadmium. Maximum particulate percentages of 100% were estimated at both the STPs, whereas maximum results at other stations varied from 20% at the Humber River, to 65% at Mimico Creek. Further work will be required to verify these observations, but they suggest the potential for discriminating between types of sources on this basis.

Suspended sediment chemistry findings (Tables 6, 7) need not be closely paralleled by the whole water sampling results (Table 4 and Appendices B and C). Variations in concentrations of suspended sediments within the water column will have a significant influence on the whole water chemistry for those instances where the particulate form predominates for a given parameter.

Results of receiving water quality testing (Table 4 and Appendices B and C) show a general tendency for lower concentrations of most physical parameters, nutrients, and metals to have been measured at the Humber River and Mimico Creek than at the Don River, despite the previous evidence that suspended sediments in Mimico Creek were generally more contaminated than those from other river inputs. Examination of the suspended sediment concentrations in whole water samples (Table B1) however, reveals medians of only 3.0 mg litre^{-1} at Mimico Creek, and 9.1 mg litre^{-1} at the Humber River, compared with 27.2 mg litre^{-1} at the mouth of the Don River, and this difference more than compensates for the greater concentration of parameters within the suspended material itself. A similar explanation can be offered for comparison of receiving water results at the Humber and Main STPs with the Don River. With the exception of TP and TKN, receiving water quality results at the STP discharges did not generally exceed those at the mouth of the Don River, despite having a greater concentration of metals within the suspended material itself.

This discussion can be extended to a comparison of water quality results at the mouth of the Don River (Stn. 1379) with those from the lower Don River, approximately 1.2 km upstream from the mouth (Stn. 2020). This comparison is of interest in that not only were median suspended sediment concentrations higher at the mouth than in the lower river, but the same was true for cadmium, iron and lead. This suggests that discharges from submerged sewer outfalls in the lower river (and possibly resuspension of previously deposited sediments) were contributing suspended sediments with associated particulate forms of these metals. The finding that conductivity (an excellent measure of dissolved solids) did not exhibit this pattern supports the supposition that particulate, rather than dissolved, forms of these metals were input to the lower river. Several other parameters (TKN, TP, DOC, Cr, Cu) followed the pattern of conductivity which suggests that particulate forms of these substances were not discharged to the lower river.

Although additional suspended sediment and water sampling should be undertaken to confirm these preliminary findings, there is strong evidence that contaminants associated with particulate matter strongly influence water chemistry, in some instances accounting for virtually the total amount of a compound in a given water sample. However, it is also evident that the concentration of suspended sediments within the water column will exert an even greater influence on whole water chemistry. This leads to the conclusion that reduction in suspended solids discharged into the Toronto waterfront from point sources such as STPs, rivers and lakefilling, can be expected to improve water quality with the greatest relative benefit occurring at the STPs where the most contaminated suspended sediments are found.

4.2 Spatial and Temporal Variation in Water Quality

The 1985 results of water clarity profiling (Table 2) confirmed findings from previous years by demonstrating significant variations in turbidity with depth at all stations. This variability with depth is of particular concern for those parameters which are present in particulate form, since any comparison among locations must address the potential for variation at one location. The results show that the potential for such variation with depth cannot be ignored, so that, depending upon how the data are to be used, it may be necessary to sample at multiple depths, or to obtain depth integrated samples in order to provide meaningful comparisons between stations. The present study avoided the issue of variability within the water column by sampling from the depth of maximum turbidity only, under the assumption that this represented the "worst case" depth for a particular location on a given day.

Quantitative comparison of mean results at each station using normal statistics requires that error variation be independent of the mean, a condition which does not appear to be satisfied for most parameters when summarized (see Tables B1 to B15). Data transformation or application of nonparametric procedures would, therefore, appear to be required to determine the significance of apparent differences among source and background stations. In most cases, however, maximum median values exceed background median values by an order of magnitude, and their ranges do not overlap - so many significant differences can be determined by simple inspection.

Before proceeding with a comparison of stations it should be observed that discussion of differences among stations alone may not be appropriate without consideration of differences among sampling periods, and that neither of these may be appropriate if significant interaction occurs between station and sampling period effects. This would occur if the magnitude of differences among stations changed from one sampling period to the next (or conversely, if the magnitude of differences among sampling periods changed from one station to the next). This situation was demonstrated to have occurred during a previous Toronto waterfront study (Boyd 1986).

Quantification of the significance of station effects, sampling period effects and interaction effects can be achieved by means of a two-way analysis of variance (ANOVA). Inspection of complete data (Appendix C) for parameters summarized in Tables B1 to B15 suggests that much of the apparent lack of independence between mean and variance results from the presence of large sampling period effects. In other words, the increased variability observed at those stations with large means may be attributable to large variations among sampling periods, rather than large sampling error during any one sampling period.

A two-way ANOVA was undertaken for those parameters with suitable results (i.e. no results less than the minimum measurable amount could be used). These were: suspended solids, turbidity, conductivity, TP, TKN, DOC, iron, chromium, copper, nickel and zinc. Results showed significant ($\alpha = 0.05$) station effects for all parameters, as well as significant sampling period effects for all parameters except suspended solids. Station effects were shown to be of greater significance than sampling period effects for all parameters except chromium, copper and zinc. However, interaction was also significant ($\alpha = 0.05$) for all parameters, rendering independent discussion of either station or sampling period effects inappropriate.

This finding leads to the conclusion that although significant differences in water quality exist among stations and among sampling periods for the Toronto waterfront, no given sampling period can be considered representative of differences among stations, and no single station appears representative of differences among sampling periods. This is not surprising given the range of factors affecting water quality across the waterfront (e.g. lake hydrodynamics, biological processes, varied drainage basin response to localized storms, varied sources and sewer system performance leading to STP's). Survey objectives must be defined as precisely as possible so that the survey design can, for example, accommodate (or eliminate) the interaction between location and sampling period which is likely to be present when comparing results obtained near different point sources.

Under these circumstances, conservative comparison of differences among stations for a given parameter using data which span the sampling season is effectively reduced to those cases where the ranges of sample results do not overlap. Under these conditions the interaction is "orderly" since the order of parameter concentrations is the same among stations, even though the magnitude of the differences changes from one sampling period to the next.

Application of this approach to the water quality parameters summarized in Tables B1 to B15 reveals that for physical parameters, nutrients and iron, major differences exist between most source stations and the open lake background station, as well as the lake stations in the vicinity of filtration plant intakes. Other general comparisons of differences among stations must be considered qualitative only, except within individual sampling periods.

4.3 Loading Estimates

Total daily contaminant loadings, based on whole water and effluent sampling, have been estimated (Table 8) using daily flow measurements from the STPs and rivers (Metro Works 1985, Environment Canada 1985) and water chemistry results from centrifuge stations. No loading computations were attempted for the lakefilling site.

Although these contaminant loading estimates cannot be considered representative for purposes of computing annual loadings, several conclusions can be reached concerning the relative significance of the sampled inputs to the waterfront. The importance of flow, and hence, differences between wet and dry weather, is clearly illustrated by results from all three river stations on 19 October following 16.6 mm of precipitation on 18 October (as recorded by the Environment Canada, Atmospheric Environment Service at Bloor St.). It is also apparent that, in general, the greatest loadings for nutrients and metals occurred at the Main STP, followed by the Humber STP, Humber River, Don River, and finally, Mimico Creek.

In addition to total loading estimates, loadings associated with the discharge of suspended sediments have been computed by combining the centrifuged sediment chemistry results for each station with centrifuged water chemistry-based estimates of suspended sediment loadings at that station (Tables 9 and 10). Previous discussion has identified problems with using these data to estimate partitioning between aqueous and particulate forms of contaminants. However, the potential for reductions in loadings of total phosphorus and most metals through reduction of suspended solids loadings is evident from Table 9.

TABLE 8: Total Daily Loadings at Toronto Waterfront Inputs

Location	Sampling Date	Daily Flow (x $10^3 m^3$)	Sus. Sol. (Kg/day)	Total P (Kg/day)	TKN (Kg/day)	Cadmium (g/day)	Chromium (Kg/day)	Copper (Kg/day)	Iron (Kg/day)	Lead (Kg/day)	Mercury (g/day)	Nickel (kg/day)	Zinc (Kg/day)
Humber STP	25/04/85	319	7,040	242	3,828	130	8.6	3.8	1,148	1.3	26	26.5	38.3
	02/05/85	339	7,024	297	4,983	980	6.1	3.4	970	1.0	-	35.3	32.9
	27/06/85	385	9,979	885	6,353	190	1.5	-	327	-	-	12.7	5.8
	17/10/85	356	6,871	320	4,094	710	22.8	8.5	3,026	5.7	39	57.0	81.9
	21/10/85	371	3,409	152	5,639	370	5.9	5.2	705	6.3	19	63.1	36.0
Main STP	24/04/85	635	6,966	635	18,098	1,270	28.6	25.4	825	8.3	38	76.2	44.5
	01/05/85	681	6,246	306	17,842	610	17.0	16.3	42	4.8	-	26.6	21.8
	01/06/85	616	10,423	385	15,831	550	19.1	14.2	450	12.3	49	40.0	28.3
	28/06/85	673	13,797	491	2,356	1,350	27.6	20.2	740	-	20	33.0	45.8
	18/10/85	703	25,744	1,476	21,231	4,220	53.4	49.9	1,687	27.4	105	45.7	119.5
	22/10/85	630	7,535	425	17,640	3,150	34.0	35.9	945	18.9	44	39.1	63.0
Mimico Creek	22/04/85	27	979	3	22	8	0.4	0.3	30	0.4	2	0.1	0.9
	04/05/85	21	820	2	21	-	0.3	0.2	36	0.7	1	0.1	1.1
	01/06/85	23	382	1	13	-	0.1	0.1	18	0.3	0.5	0.05	0.5
	24/06/85	23	363	1	15	-	-	-	1	-	0.2	-	-
	19/10/85	239	31,261	67	201	-	6.9	6.2	1,291	17.9	17	2.2	52.6
	23/10/85	15	203	1	11	-	0.2	0.1	11	0.2	0.5	0.1	0.5
Humber River	23/04/85	669	15,628	40	381	134	4.0	4.0	428	-	13	-	6.0
	04/05/85	381	11,681	19	229	-	1.9	1.9	457	6.5	8	-	6.9
	01/06/85	647	45,258	91	550	-	1.9	1.9	1,035	11.6	13	-	9.1
	27/06/85	219	9,785	20	155	-	0.2	-	74	-	-	-	-
	19/10/85	902	29,847	42	379	-	10.8	9.0	902	22.6	18	3.6	24.4
	23/10/85	311	4,077	12	168	-	1.2	1.2	183	1.9	9	0.6	3.4
Don River	03/05/85	184	5,562	35	432	37	2.4	1.8	164	2.4	2	0.9	4.0
	04/05/85	199	2,511	35	541	-	1.6	2.0	175	4.8	8	1.0	5.8
	01/06/85	275	4,700	39	547	-	1.1	1.4	253	-	6	4.4	4.7
	28/06/85	141	6,490	23	169	-	0.4	0.4	128	-	3	0.7	1.7
	19/10/85	959	83,097	172	556	-	7.7	14.4	2,781	41.2	115	5.8	71.9
	22310/85	181	1,767	24	235	-	1.3	1.1	119	1.8	5	0.9	4.9

"-" = no results available

TABLE 9: Particulate Daily Loadings at Toronto Waterfront Inputs - Nutrients and Metals

Location	Sampling Date	Total P (Kg/day)	TKN (Kg/day)	Aluminum (Kg/day)	Arsenic (g/day)	Cadmium (g/day)	Chromium (Kg/day)	Copper (Kg/day)	Iron (Kg/day)	Lead (Kg/day)	Mercury (g/day)	Nickel (kg/day)	Zinc (Kg/day)
Humber STP	25/04/85	-	-	43	64	134	3.8	2.9	704	1.1	2.5	0.7	11.3
	02/05/85	349	328	22	32	211	3.9	3.0	702	0.8	4.1	0.8	14.0
	27/06/85	239	466	-	38	-	-	-	-	-	7.8	-	-
	17/10/85	198	253	23	30	213	0.5	3.2	502	1.0	-	-	-
	21/10/85	102	141	17	20	375	4.1	0.2	293	0.9	2.5	0.7	10.6
Main STP	24/04/85	334	204	216	80	975	15.3	12.5	627	6.5	5.0	2.2	25.1
	01/05/85	280	190	169	76	618	13.7	10.6	525	5.4	11.2	1.2	21.2
	01/06/85	-	-	167	75	709	17.7	13.5	469	5.3	-	1.1	24.0
	28/06/85	781	215	510	170	1,794	33.1	30.4	924	11.9	-	2.3	48.3
	18/10/85	824	1,030	412	210	2,291	51.4	33.5	901	11.3	51.5	3.3	74.7
	22/10/85	379	253	241	87	1,281	19.6	14.3	445	5.7	6.9	1.4	27.1
Mimico Creek	22/04/85	2	3	21	11	4	0.1	0.1	29	0.3	0.1	0.04	0.6
	04/05/85	1	3	19	11	3	0.1	0.1	26	0.2	0.2	0.03	0.5
	01/06/85	1	3	8	5	2	0.1	0.1	12	0.1	0.1	0.01	0.2
	24/06/85	1	2	-	1	-	-	-	-	-	-	-	-
	19/10/85	56	119	782	308	156	5.0	4.1	938	9.7	5.0	1.2	27.2
	23/10/85	1	1	4	2	1	0.03	0.05	6	0.1	0.04	0.01	0.2
Humber River	23/04/85	20	61	281	93	22	0.7	1.0	422	2.7	1.3	0.4	3.6
	04/05/85	2	3	20	4	2	0.1	0.1	28	0.1	0.1	0.02	0.2
	01/06/85	50	77	1,131	311	24	2.4	2.7	1,403	2.9	2.7	1.2	6.8
	27/06/85	15	31	264	45	13	0.9	0.7	333	0.9	0.7	0.3	1.9
	19/10/85	46	104	507	170	72	2.1	3.0	686	6.0	6.3	0.8	10.4
	23/10/85	6	18	82	28	9	0.4	0.4	106	0.4	0.5	0.1	1.2
Don River	03/05/85	16	46	100	30	15	0.6	0.9	150	1.6	2.2	0.2	2.8
	04/05/85	6	9	48	21	6	0.3	0.6	70	0.6	1.0	0.1	1.1
	01/06/85	14	24	94	32	7	0.4	0.5	132	0.9	0.8	0.1	1.6
	28/06/85	21	23	130	48	19	1.1	0.7	233	1.2	0.8	0.2	2.3
	19/10/85	126	258	1,413	372	166	5.2	8.1	1,911	19.9	17.5	2.1	34.1
	22/10/85	7	10	34	12	6	0.2	0.3	53	0.4	0.6	0.1	0.9

"-" = no results available

Particulate loading estimates for organochlorine compounds (Table 10) have also been included, although their interpretation requires caution due to the large number of measurements near the limit of detection. These results show that for most parameters (other than PCB) under dry conditions loadings seldom exceeded 0.1 grams per day except at the Main STP (which tended to exhibit greater loadings than other stations). Under the high flow conditions encountered on 19 October, however, distinct increases occurred at the Humber River and Mimico Creek for most parameters (no results were available for the Don River). Not surprisingly, this implies that wet weather flows are of greater significance than dry for virtually all parameters, including organochlorine compounds. Annual loading estimates must, therefore, incorporate wet weather results proportionally in order to be considered representative. This may be achieved by proportional (event based) sampling, or by adjusting data according to an appropriate flow-concentration relationship.

TABLE 10: Particulate Daily Loadings (Grams per Day) at Toronto Waterfront Inputs - Organochlorine Compounds

Location: Humber STP

Compounds Detected	Sampling Dates					
	May 2	June 27	October 17	October 21		
PCBs	1.51	2.20	0.45	1.21		
HCB	0.07	-	0.02	0.03		
beta - BHC	nd	nd	0.01	nd		
alpha - chlordane	nd	nd	nd	0.07		
gamma - chlordane	0.06	nd	nd	0.04		
oxychlordane	nd	0.20	nd	nd		
p,p - DDT	nd	nd	nd	0.10		
p,p - DDE	0.09	0.06	0.08	0.12		
DMDT	nd	nd	1.17	0.05		
endosulphan sulphate	nd	nd	nd	0.10		
dieldrin	nd	1.60	nd	nd		
endrin	nd	nd	0.07	0.03		
heptachlor epoxide	nd	0.20	nd	nd		

Location: Main STP

	May 1	June 1	June 28	October 18	October 22	
PCBs	2.34	3.54	2.55	16.73	6.56.	
HCB	0.56	0.68	0.51	2.14	0.56	
beta - BHC	nd	nd	0.01	nd	nd	
gamma - BHC	nd	nd	0.01	nd	nd	
alpha - chlordane	0.04	0.21	nd	nd	0.07	
gamma - chlordane	0.06	0.16	nd	nd	0.07	
oxychlordane	0.06	nd	nd	nd	nd	
p,p - DDE	0.03	0.25	0.10	0.85	0.41	
p,p - DDD	nd	0.21	nd	nd	nd	
DMDT	0.21	nd	nd	6.44	0.61	
endosulphan I	0.32	0.46	nd	nd	0.24	
endosulphan sulphate	nd	0.93	nd	1.13	0.20	
dieldrin	0.23	1.01	nd	1.08	0.27	
endrin	nd	0.68	nd	1.42	0.26	
heptachlor epoxide	nd	nd	nd	0.90	0.22	

Compounds Detected	Sampling Dates					
	April 22	May 4	June 1	June 24	October 19	October 23
Location: Mimico Creek						
PCBs	0.20	0.42	0.11	0.13	10.16	0.07
HCB	-	0.01	<0.01	<0.01	nd	<0.01
alpha-chlordane	-	nd	0.01	nd	0.38	<0.01
gamma-chlordane	-	nd	0.01	nd	0.31	<0.01
oxychlordane	-	nd	nd	<0.01	nd	nd
p,p - DDT	-	0.01	<0.01	nd	0.31	nd
p,p - DDE	-	0.02	0.01	0.01	0.28	<0.01
p,p - DDD	-	0.02	0.01	nd	nd	<0.01
DMDT	-	nd	nd	nd	0.38	0.01
endosulphan I	-	nd	0.02	nd	0.25	<0.01
endosulphan II	-	0.01	nd	nd	nd	nd
endosulphan sulphate	-	0.01	0.01	nd	0.19	<0.01
dieldrin	-	<0.01	0.01	0.01	0.16	<0.01
endrin	-	nd	nd	nd	0.41	<0.01
heptachlor epoxide	-	nd	<0.01	0.01	0.25	<0.01

TABLE 10: Particulate Daily Loadings (Grams per Day) at Toronto Waterfront Inputs - Organochlorine Compounds

Location: Humber River

Compounds Detected	Sampling Dates					
	April 23	May 4	June 1	June 27	October 19	October 23
PCBs	1.80	0.27	2.72	0.88	7.31	0.65
HCB	-	<0.01	nd	0.01	nd	nd
alpha-chlordane	-	0.01	0.09	nd	0.27	0.01
gamma-chlordane	-	0.01	0.09	nd	0.30	0.03
p,p - DDT	-	0.01	nd	nd	0.30	nd
p,p - DDE	-	0.01	0.14	0.06	0.39	0.03
p,p - DDD	-	0.03	nd	nd	0.45	0.04
DMDT	-	nd	nd	0.10	3.31	0.09
endosulphan I	-	nd	nd	nd	0.84	0.05
endosulphan II	-	nd	nd	nd	0.30	nd
endosulphan sulphate	-	nd	nd	nd	0.48	0.08
dieldrin	-	0.01	0.18	0.05	0.27	nd
endrin	-	nd	nd	nd	0.45	0.03
heptachlor epoxide	-	0.01	nd	0.02	0.60	0.05
mirex	-	nd	nd	nd	0.15	nd

Compounds Detected	Sampling Dates					
	May 3	May 4	June 2	June 28	October 22	
Location: Don River						
PCBs	2.22	0.35	1.36	0.71	nd	
HCB	0.03	nd	0.13	0.01	nd	
gamma-BHC	0.02	0.04	nd	nd	nd	
alpha-chlordane	0.11	0.04	nd	nd	0.02	
gamma-chlordane	0.13	0.04	nd	nd	0.02	
p,p - DDT	0.06	0.02	nd	nd	0.01	
p,p - DDE	0.05	0.02	0.05	0.05	0.16	
p,p - DDD	0.11	0.04	nd	nd	0.04	
DMDT	1.10	nd	nd	nd	0.15	
endosulphan I	nd	nd	nd	nd	0.03	
endosulphan II	0.02	nd	nd	nd	nd	
endosulphan sulphate	0.18	nd	nd	nd	0.01	
dieldrin	0.12	nd	nd	nd	0.20	
endrin	nd	0.01	nd	nd	0.05	
heptachlor epoxide	nd	0.05	nd	nd	0.04	

"nd" = not detected
"-" = no result available
Loading estimates of less than 0.01 grams per day have not been listed since this apparent precision is not warranted by the limited precision of the data used in the computations.

5.0 CONCLUSIONS

5.1 Water and Suspended Sediment Quality

Major findings of the 1985 investigation into water and suspended sediment quality across the Toronto waterfront were as follows:

(1) Ministry water quality objectives (or guidelines) for the protection of aquatic life and recreational use (MOE 1984) were exceeded within the study area for nutrients (total phosphorus), metals (cadmium, copper, iron, nickel, lead, and zinc), organochlorine compounds (lindane, heptachlor/heptachlor epoxide, aldrin/dieldrin, DDT and metabolites), and pentachlorophenol. The extent and frequency of the violations varied widely depending upon the parameter (see Table B16). Some, such as nickel, lead, pentachlorophenol, and the organochlorine compounds, were detected at only one or two stations in fewer than half the samples taken. Remedial measures will be required if provincial water quality objectives are to be met on all occasions at all locations (particularly in the vicinity of sewage treatment plant outfalls, river mouths, and lakefilling at the East Headland).

(2) Suspended material sampled at the sewage treatment plants (STPs) had generally higher concentrations of nutrients, metals and organochlorine compounds than that sampled at river mouths or the lakefilling site. This appeared to be related to elevated levels of organic material and oil and grease. In general, the Main STP exhibited greater concentrations of contaminants than the Humber STP. Of the river and lakefill sources, maximum concentrations tended to be observed at Mimico Creek.

(3) Estimates of partitioning between aqueous and particulate forms of contaminants, based on a comparison of centrifuged sediments and corresponding whole water, were generally too variable to allow comparison of sources. This was probably the result of a composite whole water or effluent sampling methodology which did not adequately reflect the quality of water actually passed through the centrifuge. Distinct differences in aqueous/particulate partitioning were seen between the STPs and river sources for total Kjeldahl nitrogen, nickel and cadmium, however, and the approach would appear to be worth pursuing provided improvements are made in the sampling methodology.

(4) Comparison of water quality results revealed that differences in the quality of suspended sediment among stations had less effect on water quality than concentrations of suspended sediments within the water column. As a result, water quality at both Mimico Creek and the Humber River was generally better than at the Don River, and total metal concentrations in the vicinity of the STP discharges were generally similar to those at the mouth of the Don River. This finding identifies the need for caution when establishing impact assessment objectives, since an assessment on the basis of whole water quality alone may differ from an assessment also employing suspended sediment quality.

(5) Collection of both turbidity and temperature profiles indicated that significant variation in concentration of suspended solids, occurred throughout the water column at individual stations, probably as the result of both thermal density gradients and turbulence generated by waves and currents. The need for caution during the development of impact assessment objectives is indicated once again, since at many locations sampling from a single depth cannot be considered representative of the entire water column.

(6) Water quality parameters exhibited both significant differences among stations and among sampling periods. However, no single sampling period could be considered representative of differences among stations, and no single station could be considered representative of differences among sampling periods. This also has implications for development of impact assessment objectives, since it demonstrates that comparison of annual mean water quality results may not be meaningful.

5.2 Contaminant Loadings

(1) Computation of loading estimates for nutrients, metals, and organics, using both whole water/effluent and suspended sediment results, illustrated the significance of flow data (as compared with water quality or suspended sediment quality). The river loadings were particularly sensitive to flow due to the relatively wide range of flow conditions encountered at rivers compared with STP's. The significance of wet versus dry conditions was clearly established, and hence the need for proportional sampling or data adjustment for computation of annual loads.

(2) Based on a qualitative comparison of only five or six (depending upon location) sampling episodes, the Main STP was found to be the greatest source of nutrients, metals and organics, followed (for nutrients and metals) by the Humber STP, the Humber River, the Don River, and Mimico Creek (organics results were insufficient to allow comparison among these sources). This finding also shows the need for careful development of impact assessment objectives since an assessment which includes a comparison of loading estimates may differ from an assessment on the basis of water quality alone.

(3) Calculation of loading estimates based on suspended sediment quality alone showed the potential for reduction in total loadings of total phosphorus and most metals, through reduction of suspended sediment discharges at STPs and rivers (although the environmental significance of reduction in particulate forms of contaminants will require further study).

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APPENDIX A: LIST OF WATER QUALITY TESTS FOR 1985 TORONTO WATERFRONT SURVEY

Physical Parameters

Conductivity 25DC
Suspended Solids
Turbidity

Nutrients

Total Phosphorus
Total Kjeldahl Nitrogen
Dissolved Organic Carbon

Trace Metals

Iron
Silver
Arsenic
Cadmium
Chromium
Copper
Mercury (filtered)
Mercury (unfiltered)
Nickel
Lead
Selenium
Zinc

Chlorophenols

2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2,3,4-Trichlorophenol
2,3,5,6-Tetrachlorophenol
2,3,4,5-Tetrachlorophenol
Pentachlorophenol

Phenoxyacid Herbicides

Dicamba
2,4,D-Propionic acid
2,4-Dichlorophenoxyacetic
Silvex
2,4,5-Trichlorophenoxyacetic
2,4-Dichlorophenoxybutyric
Picloram

PCB, Organochlorine Pesticides

PCB, Total
Hexachlorobenzene
Heptachlor
Aldrin
PP-DDE
Mirex
A-BHC Hexachlorocyclohexane
B-BHC Hexachlorocyclohexane
G-BHC Hexachlorocyclohexane
A-Chlordane
G-Chlordane
Oxychlordane
OP-DDT
PP-DDD
PP-DDT.
DMDT-Methoxychlor
Heptachlorepoxide
Endosulphan I
Dieldrin
Endrin
Endosulphan II
Endosulphan Sulphate
Octachlorostyrene

Chlorobenzenes

Hexachloroethane
1,3,5-Trichlorobenzene
1,2,4-Trichlorobenzene
Hexachlorobutadiene
1,2,3-Trichlorobenzene
2,4,5-Trichlorotuluene
2,3,6-Trichlorotoluene
1,2,3,5-Tetrachlorobenzene
1,2,4,5-Tetrachlorobenzene
2,6,a-Trichlorotoluene
1,2,3,4-Tetrachlorobenzene
Pentachlorobenzene

APPENDIX B

WATER QUALITY SUMMARY

TABLE B1: Suspended Solids (mg/litre)

Minimum Measurable Amount (MMA) = 0.2 mg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	-	5.3	1.9	3.0	3.41	1.18
2072	12	100	-	17.8	4.0	5.7	7.49	4.86
9053	12	100	-	17.4	2.1	9.1	9.27	4.93
*	*	*	*	*	*	*	*	*
1536	10	100	-	1.7	0.2	1.4	1.07	0.61
*	*	*	*	*	*	*	*	*
1364	10	100	-	12.3	2.2	6.0	6.37	3.67
2017	4	100	-	34.0	12.4	26.0	24.75	10.17
1379	10	100	-	39.7	15.2	27.2	26.04	9.44
2020	8	100	-	36.1	6.0	10.9	16.19	12.73
*	*	*	*	*	*	*	*	*
1987	10	100	-	83.4	6.5	18.5	24.84	22.64
1419	10	100	-	26.3	2.9	3.9	6.99	7.61
*	*	*	*	*	*	*	*	*
2029	10	100	-	4.8	0.2	1.4	1.61	1.33
1997	10	100	-	1.8	0.2	1.4	0.92	0.67

TABLE B2: Turbidity (FTU)

Minimum Measurable Amount (MMA) = 0.4 FTU

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	-	7.8	1.6	3.5	4.01	1.98
2072	12	100	-	12.4	2.2	4.7	5.31	3.20
9053	12	100	-	23.0	2.3	9.0	9.84	6.73
*	*	*	*	*	*	*	*	*
1536	10	100	-	4.2	0.5	2.5	2.13	1.26
*	*	*	*	*	*	*	*	*
1364	10	100	-	11.8	2.4	4.6	5.74	3.32
2017	4	100	-	31.0	14.1	24.0	23.4	8.40
1379	10	100	-	45.0	9.1	15.7	21.51	12.72
2020	8	100	-	38.0	7.3	12.3	17.98	12.85
*	*	*	*	*	*	*	*	*
1987	10	100	-	56.0	5.8	14.0	18.61	15.36
1419	10	100	-	25.0	1.1	4.1	7.50	8.63
*	*	*	*	*	*	*	*	*
2029	10	100	-	2.9	1.1	1.6	1.65	0.65
1997	10	100	-	3.6	0.8	1.4	1.65	0.85

TABLE B3: Conductivity (uS/cm)

Minimum Measurable Amount (MMA) = 0.1 uS/cm

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	-	382	334	363	360.3	15.9
2072	12	100	-	518	325	443	429.0	57.0
9053	12	100	-	444	356	419	406.6	32.5
*	*	*	*	*	*	*	*	*
1536	10	100	-	329	318	322	323.8	4.5
*	*	*	*	*	*	*	*	*
1364	10	100	-	360	338	343	346.3	8.6
2017	4	100	-	467	413	416	428.0	26.1
1379	10	100	-	906	394	751	687.7	181.6
2020	8	100	-	1013	792	906	903.0	83.8
*	*	*	*	*	*	*	*	*
1987	10	100	-	346	319	323	326.4	9.4
1419	10	100	-	526	401	444	464.7	43.1
*	*	*	*	*	*	*	*	*
2029	10	100	-	326	318	322	321.8	3.0
1997	10	100	-	326	317	319	320.5	3.4

TABLE B4: Total Phosphorus (mg/litre)

Minimum Measurable Amount (MMA) = 4 µg/Litre
Provincial Water Quality Objective (PWQO) = 20 µg/litre
guideline

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	92	62	19	31	35.9	13.6
2072	12	100	100	395	140	229	239.8	82.7
9053	12	100	83	116	12	37	51.5	35.0
*	*	*	*	*	*	*	*	*
1536	10	100	20	26	7	13	14.5	6.4
*	*	*	*	*	*	*	*	*
1364	10	100	60	48	12	24	25.6	13.0
2017	4	100	100	98	66	79	80.5	15.5
1379	10	100	100	205	65	140	139.3	42.9
2020	8	100	100	260	147	157	177.9	42.5
*	*	*	*	*	*	*	*	*
1987	10	100	90	59	13	42	38.4	14.9
1419	10	100	100	1,080	73	144	305.1	376.8
*	*	*	*	*	*	*	*	*
2029	9	100	0	18	7	13	13.0	4.6
1997	10	100	10	21	7	12	12.7	5.2

TABLE B5: Total Kjeldahl Nitrogen (ug/litre)

Minimum Measurable Amount (MMA) = 88 µg/litre

Station	Sample Size	%> MRA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	-	1,420	540	595	718.3	284.4
2072	12	100	-	4,950	340	2,160	2,423.3	1,333.4
9053	12	100	-	1,730	260	635	733.3	491.9
*	*	*	*	*	*	*	*	*
1536	10	100	-	410	190	350	308.0	85.0
*	*	*	*	*	*	*	*	*
1364	10	100	-	490	220	395	360.0	106.4
2017	4	100	-	1,770	650	855	1,032.5	502.4
1379	10	100	-	2,170	530	1,135	1,328.0	676.2
2020	8	100	-	2,300	1,070	1,990	1,833.8	513.5
*	*	*	*	*	*	*	*	*
1987	10	100	-	900	210	330	419.0	242.1
1419	10	100	-	8,750	1,610	5,250	5,381.0	2,455.3
*	*	*	*	*	*	*	*	*
2029	9	100	-	420	210	270	294.4	71.6
1997	10	100	-	340	170	255	264.0	67.4

TABLE B6: Dissolved Organic Carbon (mg/litre)

Minimum Measurable Amount (MMA) = 0.49 mg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	-	2.7	2.1	2.4	2.37	0.19
2072	12	100	-	4.4	2.7	3.4	3.50	0.58
9053	12	100	-	3.1	2.3	2.6	2.63	0.28
*	*	*	*	*	*	*	*	*
1536	10	100	-	2.3	2.0	2.2	2.12	0.09
*	*	*	*	*	*	*	*	*
1364	10	100	-	2.4	2.0	2.1	2.16	0.14
2017	4	100	-	2.7	2.4	2.5	2.53	0.13
1379	10	100	-	5.8	2.4	3.6	3.93	1.18
2020	8	100	-	5.8	3.6	5.2	4.74	0.86
*	*	*	*	*	*	*	*	*
1987	10	100	-	2.3	1.9	2.1	2.07	0.12
1419	10	100	-	7.0	4.0	5.1	5.27	1.10
*	*	*	*	*	*	*	*	*
2029	10	100	-	2.1	1.9	2.0	2.02	0.06
1997	10	100	-	2.3	1.9	2.0	2.02	0.12

TABLE B7: Arsenic (µg/litre)

Minimum Measurable Amount (MMA) = 1 µg/litre)
Provincial Water Quality Objective (PWQO) = 100 µg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	50	0	1	ND	1	-	-
2072	12	67	0	1	ND	1	-	-
9053	12	33	0	1	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1536	10	40	0	1	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1364	10	40	0	1	ND	ND	-	-
2017	4	0	0	ND	ND	ND	-	-
1379	10	30	0	1	ND	ND	-	-
2020	10	0	0	ND	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1987	10	40	0	1	ND	ND	-	-
1419	10	60	0	1	ND	1	-	-
*	*	*	*	*	*	*	*	*
2029	10	60	0	2	ND	1	-	-
1997	10	60	0	1	ND	1	-	-

ND - not detected

TABLE B8: Cadmium (µg/litre)

Minimum Measurable Amount (MMA) = 0.2 µg/litre
Provincial Water Quality Objective (PWQO) = 0.2 µg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	25	25	25	0.7	ND	ND	-	-
2072	12	67	58	0.8	ND	0.3	-	-
9053	12	25	17	0.3	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1536	10	0	0	ND	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1364	10	0	0	ND	ND	ND	-	-
2017	4	25	0	0.2	ND	ND	-	-
1379	10	20	10	0.5	ND	ND	-	-
2020	10	20	0	0.2	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1987	10	0	0	ND	ND	ND	-	-
1419	10	50	20	0.4	ND	ND	-	-
*	*	*	*	*	*	*	*	*
2029	10	0	0	ND	ND	ND	-	-
1997	10	10	10	0.3	ND	ND	-	-

TABLE B9: Copper (µg/litre)

Minimum Measurable Amount (MMA) = 1 µg/litre
Provincial Water Quality Objective (PWQO) = 5 µg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	42	7	1	3	3.8	2.5
2072	12	100	75	20	5	8	7.8	4.3
9053	12	100	33	7	1	3	3.9	2.4
*	*	*	*	*	*	*	*	*
1536	10	100	0	5	1	2	2.6	1.8
*	*	*	*	*	*	*	*	*
1364	10	100	30	35	1	4	8.4	11.6
2017	4	100	50	10	4	7	7.0	2.9
1379	10	100	80	15	3	7	8.1	3.5
2020	10	100	100	41	6	8	14.1	11.1
*	*	*	*	*	*	*	*	*
1987	10	100	20	7	2	4	3.8	1.6
1419	10	100	60	33	3	6	11.1	11.4
*	*	*	*	*	*	*	*	*
2029	10	100	0	4	1	2	2.4	1.4
1997	10	100	10	6	1	2	2.7	1.9

TABLE B10: Chromium (µg/litre)

Minimum Measurable Amount (MMA) = 1 µg/litre
Provincial Water Quality Objective (PWQO) = 300 µg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	0	5	1	3	2.4	1.3
2072	12	100	0	18	3	8	9.4	4.7
9053	12	83	0	9	ND	3	-	-
*	*	*	*	*	*	*	*	*
1536	10	70	0	3	ND	1	-	-
*	*	*	*	*	*	*	*	*
1364	10	60	0	15	ND	2	-	-
2017	4	100	0	12	2	7	7.0	5.2
1379	10	100	0	21	2	5	9.3	7.0
2020	10	100	0	29	3	9	11.8	9.6
*	*	*	*	*	*	*	*	*
1987	10	100	0	3	1	2	2.0	0.8
1419	10	100	0	49	3	6	14.4	18.3
*	*	*	*	*	*	*	*	*
2029	10	60	0	4	ND	1	-	-
1997	10	60	0	2	ND	1	-	-

TABLE B11: Iron (μg/litre)

Minimum Measurable Amount (MMA) = 1 μg/litre
Provincial Water Quality Objective (PWQO) = 300 μg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	17	340	69	125	161.4	100.9
2072	12	100	83	970	80	535	539.2	291.4
9053	12	100	25	1,400	42	290	421.4	467.1
1536	10	100	0	44	6	28	27.4	11.5
1364	10	100	0	260	63	150	148.0	60.5
2017	4	100	100	1,070	480	760	767.5	291.1
1379	10	100	100	1,200	520	895	850.0	225.3
2020	10	100	100	1,200	350	480	610.0	327.5
1987	10	100	80	4,300	130	700	1,414.0	1,537.4
1419	10	100	20	1,400	100	190	412.0	521.6
2029	10	100	0	28	8	15	16.7	7.0
1997	10	100	0	22	6	14	14.0	5.1

TABLE B12: **Mercury (filtered) (µg/litre)**

Minimum Measurable Amount (MMA) = 0.01 µg/litre
Provincial Water Quality Objective (PWQO) = 0.2 µg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	8	75	0	0.07	ND	0.01	-	-
2072	8	88	0	0.04	ND	0.02	-	-
9053	8	63	0	0.03	ND	0.01	-	-
*	*	*	*	*	*	*	*	*
1536	6	50	0	0.01	ND	0.01	-	-
*	*	*	*	*	*	*	*	*
1364	4	0	0	ND	ND	ND	-	-
2017	4	50	0	0.02	ND	0.02	-	-
1379	4	100	0	0.02	ND	0.02	-	-
2020	4	100	0	0.01	ND	0.01	-	-
*	*	*	*	*	*	*	*	*
1987	6	50	0	0.02	ND	0.01	-	-
1419	6	67	0	0.02	ND	0.01	-	-
*	*	*	*	*	*	*	*	*
2029	6	33	0	0.02	ND	ND	-	-
1997	6	33	0	0.01	ND	ND	-	-

ND - not detected

TABLE B13: Nickel (μg/litre)

Minimum Measurable Amount (MMA) = 1 μg/litre
Provincial Water Quality Objective (PWQO) = 25 μg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	0	14	2	4	5.3	4.2
2072	12	100	33	30	2	22	19.6	9.8
9053	12	83	0	6	ND	3	-	-
*								
1536	10	50	0	3	ND	1	-	-
*								
1364	10	60	0	2	ND	2	-	-
2017	4	100	0	3	2	3	2.8	0.5
1379	10	100	0	7	2	4	4.3	1.6
2020	10	90	0	14	ND	5	-	-
*								
1987	10	90	0	4	ND	2	-	-
1419	10	100	0	13	4	8	8.1	3.0
*								
2029	10	40	0	2	ND	ND	-	-
1997	10	40	0	2	ND	ND	-	-

ND - not detected

TABLE B14: Lead (µg/litre)

Minimum Measurable Amount (MMA) = 3 µg/litre
Provincial Water Quality Objective (PWQO) = 25 µg/litre (variable)

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	50	0	7	ND	3	-	-
2072	11	27	0	4	ND	ND	-	-
9053	12	58	0	6	ND	3	-	-
*	*	*	*	*	*	*	*	*
1536	10	30	0	8	ND	ND	-	-
*	*	*	*	*	*	*	*	*
1364	10	60	0	4	ND	3	-	-
2017	4	100	0	13	7	12	11.0	2.8
1379	10	100	0	18	8	15	13.3	3.4
2020	10	90	0	14	ND	9	-	-
*	*	*	*	*	*	*	*	*
1987	10	80	20	93	ND	7	-	-
1419	10	80	0	15	ND	4	-	-
*	*	*	*	*	*	*	*	*
2029	10	30	0	7	ND	ND	-	-
1997	10	30	0	6	ND	ND	-	-

ND - not detected

TABLE B15: Zinc (µg/litre)

Minimum Measurable Amount (MMA) = 1 µg/litre
Provincial Water Quality Objective (PWQO) = 30 µg/litre

Station	Sample Size	%> MMA	%> PWQO	Max.	Min.	Median	Mean	Stnd. Dev.
2054	12	100	17	50	4	7	16.1	17.3
2072	12	100	50	80	3	30	32.6	22.0
9053	12	100	0	16	1	5	6.3	4.8
*	*	*	*	*	*	*	*	*
1536	10	60	0	3	ND	1	-	-
*	*	*	*	*	*	*	*	*
1364	10	100	0	16	2	5	6.4	5.0
2017	4	100	0	18	12	15	14.8	2.8
1379	10	100	0	28	12	23	22.0	4.9
2020	10	100	10	34	16	20	22.2	5.8
*	*	*	*	*	*	*	*	*
1987	10	100	20	220	3	9	45.8	81.9
1419	10	100	20	100	5	7	23.5	34.1
*	*	*	*	*	*	*	*	*
2029	10	60	0	4	ND	2	-	-
1997	10	60	0	5	ND	2	-	-

ND - not detected

TABLE B16: TORONTO WATER QUALITY 1985 --- MAXIMUM CONCENTRATIONS OF TOTAL PHOSPHORUS, METALS, AND TRACE ORGANIC COMPOUNDS
WITH PERCENTAGE OF SAMPLES DETECTED IN EXCESS OF PROVINCIAL WATER QUALITY OBJECTIVES

PARAMETER:	TP ug/l		Cd ug/l		Cu ug/l		Fe ug/l		Ni ug/l		Pb ug/l		Zn ug/l		LINDANE ng/l		HEPTCHLR/ EPOX ng/l		ALD/DIEL ng/l		SUM OF DDT ng/l		PENTACHLR PHNL ng/l	
PWQO:	20*		0.2		5		300		25		25**		30		10		1		1		3		500	
STATIONS																								
2054 Mimico Cr.	62	92%	0.7	25%	7	42%	340	17%	14	0%	7	0%	50	17%	5	0%	ND	0%	ND	0%	ND	0%	ND	0%
2072 Humber STP	395	100%	0.8	58%	20	75%	970	83%	30	33%	4	0%	80	50%	6	0%	ND	0%	ND	0%	ND	0%	60	0%
9053 Humber R.	116	83%	0.3	17%	7	33%	1400	25%	6	0%	6	0%	16	0%	2	0%	1	0%	ND	0%	ND	0%	ND	0%
1536 Island FP.	26	20%	ND	0%	5	0%	44	0%	3	0%	8	0%	3	0%	ND	0%	ND	0%	ND	0%	ND	0%	343	0%
1364 Harbour	48	60%	ND	0%	35	30%	260	0%	2	0%	4	0%	16	0%	10	0%	2	10%	ND	0%	ND	0%	ND	0%
2017 Dredging	98	100%	0.2	0%	10	50%	1070	100%	3	0%	13	0%	18	0%	5	0%	1	0%	ND	0%	ND	0%	ND	0%
1379 Cherry St.	205	100%	0.5	10%	15	80%	1200	100%	7	0%	18	0%	28	0%	89	30%	6	10%	11	50%	ND	0%	842	22%
2020 Lower Don	260	100%	0.2	0%	41	100%	1200	100%	14	0%	14	0%	34	10%	42	25%	7	25%	3	25%	ND	0%	144	0%
1987 Lakefill	59	90%	ND	0%	7	20%	4300	80%	4	0%	93	20%	22	20%	ND	0%	ND	0%	1	0%	5	10%	ND	0%
1419 Main STP	1080	100%	0.4	20%	33	60%	1400	20%	13	0%	15	0%	100	20%	2	0%	2	10%	ND	0%	ND	0%	285	0%
2029 Harris FP.	18	0%	ND	0%	4	0%	28	0%	2	0%	7	0%	4	0%	ND	0%	ND	0%	ND	0%	ND	0%	117	0%
1997 Control	21	10%	0.3	10%	6	10%	22	0%	2	0%	6	0%	5	0%	1	0%	ND	0%	ND	0%	ND	0%	ND	0%

"* " INDICATES GUIDELINE ONLY
"**" INDICATES VARIABLE OBJECTIVE
"ND" INDICATES NOT DETECTED

APPENDIX C

WATER QUALITY DATA LISTING

STATION ID: 1364 TORONTO INNER HARBOUR

LAT: 43 38 07.00 LONG: 079 22 17.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1516	2.0	11066	360.0	6.4	4.90	0.023	0.390	2.2	0.130	ND	ND	ND
			11067	360.0	9.5	4.30	0.024	0.400	2.2	0.110	ND	ND	ND
850717	1939	3.0	11889	351.0	5.9	7.10	0.032	0.480	2.4	0.170	ND	ND	ND
			11891	352.0	5.9	5.30	0.036	0.510	2.4	0.180	ND	ND	ND
850808	1250	8.0	15385	338.0	12.3	11.80	0.043	0.430	2.0	0.210	ND	ND	ND
			15386	338.0	11.7	10.90	0.048	0.440	2.1	0.260	ND	ND	ND
851017	1625	7.0	16681	343.0	3.3	3.50	0.014	0.250	2.0	0.150	ND	0.001	ND
			16682	342.0	3.7	3.90	0.015	0.270	2.1	0.150	ND	0.001	ND
851023	1425	6.0	16723	340.0	2.2	2.40	0.012	0.220	2.1	0.063	ND	0.001	ND
			16724	340.0	2.7	2.40	0.012	0.230	2.1	0.067	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1516	2.0	11066	ND	0.035	0.01	ND	ND	ND	0.016
			11067	ND	0.024	0.01	ND	ND	ND	0.013
850717	1939	3.0	11889	0.003	0.004	ND	0.002	0.004	ND	0.009
			11891	0.003	0.004	ND	0.002	ND	ND	0.006
850808	1250	8.0	15385	0.002	0.005	ND	0.001	0.003	ND	0.004
			15386	0.015	0.007	ND	0.002	0.004	ND	0.005
851017	1625	7.0	16681	ND	0.001	ND	ND	0.003	ND	0.002
			16682	0.002	0.001	ND	ND	0.004	ND	0.003
851023	1425	6.0	16723	ND	0.001	ND	0.002	0.003	ND	0.002
			16724	0.001	0.002	ND	0.002	ND	ND	0.002

STATION ID: 1379 MOUTH OF DON RIVER WEST OF CHERRY STREET BRIDGE

LAT: 43 38 50.00 LONG: 079 21 18.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1455	2.0	11064	396.0	33.2	22.00	0.083	0.820	2.5	0.880	ND	ND	ND
			11065	394.0	28.8	25.00	0.065	0.730	2.4	0.600	ND	ND	ND
850717	2000	1.0	11892	613.0	39.0	43.00	0.140	2.050	4.4	1.100	ND	ND	ND
			11893	625.0	39.7	45.00	0.140	2.170	4.6	1.200	ND	ND	0.0005
850808	1321	1.0	15387	752.0	15.2	12.90	0.205	2.050	5.7	0.560	ND	ND	0.0002
			15388	750.0	15.3	14.80	0.190	2.050	5.8	0.520	ND	ND	ND
851017	1515	5.0	16679	766.0	26.0	16.50	0.149	0.530	3.3	0.930	ND	ND	ND
	1520		16688	770.0	28.4	9.10	0.165	0.610	3.5	0.920	ND	0.001	ND
851023	1443	1.5	16725	905.0	16.6	12.90	0.127	1.120	3.5	0.900	ND	0.001	ND
			16732	906.0	18.2	13.90	0.129	1.150	3.6	0.890	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1455	2.0	11064	0.003	0.005	0.02	0.003	0.013	ND	0.018
			11065	0.002	0.003	0.02	0.002	0.009	ND	0.012
850717	2000	1.0	11892	0.017	0.008	--	0.005	0.008	ND	0.018
			11893	0.019	0.009	--	0.006	0.009	ND	0.021
850808	1321	1.0	15387	0.021	0.015	0.01	0.007	0.015	ND	0.026
			15388	0.013	0.013	0.01	0.006	0.015	ND	0.023
851017	1515	5.0	16679	0.004	0.007	0.01	0.003	0.015	ND	0.023
	1520		16688	0.004	0.007	0.01	0.003	0.015	ND	0.028
851023	1443	1.5	16725	0.005	0.007	ND	0.004	0.018	ND	0.025
			16732	0.005	0.007	ND	0.004	0.016	ND	0.026

STATION ID: 1419 LAKE ONTARIO AT MAIN STP DISCHARGE

LAT: 43 38 55.00 LONG: 079 18 51.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1241	1.0	11054	509.0	3.4	3.40	0.121	7.000	6.9	0.100	ND	0.001	ND
			11055	504.0	3.2	6.40	0.131	6.900	7.0	0.130	ND	0.001	ND
850717	1652	2.5	11882	510.0	14.5	22.00	1.080	8.500	5.7	1.400	ND	ND	0.0020
			11883	526.0	26.3	25.00	0.950	8.750	6.0	1.400	ND	ND	0.0020
850808	1022	1.0	15379	401.0	2.9	5.60	0.181	4.900	5.0	0.190	ND	ND	0.0004
			15380	438.0	3.9	4.80	0.157	3.300	5.2	0.190	ND	ND	0.0002
851017		1.0	16674	439.0	3.0	1.13	0.106	4.900	4.3	0.1900	ND	0.001	ND
	1312		16673	448.0	3.8	1.86	0.158	5.600	4.5	0.200	ND	0.001	ND
851023	1012	1.0	16711	437.0	4.3	2.50	0.094	2.350	4.1	0.1600	ND	0.001	0.0003
			16712	435.0	4.6	2.30	0.073	1.610	4.0	0.1600	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1241		11054	0.005	0.003	0.02	0.008	0.002	ND	0.006
			11055	0.005	0.005	0.02	0.008	0.002	ND	0.006
850717	1652		11882	0.049	0.032	0.01	0.013	0.014	ND	0.100
			11883	0.049	0.033	0.01	0.013	0.015	ND	0.074
850808	1022		15379	0.006	0.009	ND	0.008	0.004	ND	0.007
			15380	0.006	0.008	ND	0.008	ND	ND	0.007
851017			16674	0.008	0.006	ND	0.007	0.006	ND	0.013
	1312		16673	0.008	0.006	ND	0.008	ND	ND	0.010
851023	1012		16711	0.005	0.005	ND	0.004	0.005	ND	0.007
			16712	0.003	0.004	ND	0.004	0.003	ND	0.005

STATION ID: 1536 LAKE ONTARIO NORTH OF ISLAND FILTRATION PLANT INTAKES

LAT: 43 36 21.00 LONG: 079 23 15.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1042	1.0	11050	329.0	1.7	4.20	0.012	0.350	2.1	0.024	ND	ND	ND
			11051	328.0	1.4	2.70	0.012	0.350	2.0	0.044	ND	ND	ND
850717	1319	6.0	11878	329.0	1.6	2.50	0.017	0.380	2.0	0.040	ND	ND	ND
			11879	329.0	1.7	3.60	0.016	0.300	2.1	0.037	ND	ND	ND
850807	1249	4.0	15375	322.0	1.4	2.40	0.026	0.410	2.3	0.026	ND	ND	ND
			15376	321.0	1.1	2.60	0.024	0.410	2.2	0.024	ND	ND	ND
851017	1115	1.0	16669	322.0	0.1	0.51	0.007	0.190	2.1	0.014	ND	0.001	ND
			16670	322.0	0.1	0.68	0.009	0.190	2.1	0.030	ND	0.001	ND
851023	1159	6.0	16715	318.0	0.8	1.15	0.013	0.270	2.1	0.029	ND	0.001	ND
			16716	318.0	0.4	0.95	0.009	0.230	2.2	0.006	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1042	1.0	11050	0.001	0.001	0.01	ND	ND	ND	0.001
			11051	0.001	0.003	0.01	0.003	ND	ND	0.002
850717	1319	6.0	11878	0.003	0.004	0.01	0.002	ND	ND	0.003
			11879	0.003	0.004	ND	0.002	ND	ND	0.003
850807	1249	4.0	15375	0.001	0.005	ND	0.001	ND	ND	0.001
			15376	0.002	0.005	ND	0.001	ND	ND	0.001
851017	1115	1.0	16669	ND	0.001	ND	ND	0.003	ND	ND
			16670	0.001	0.001	ND	ND	0.008	ND	ND
851023	1159	6.0	16715	ND	0.001	ND	ND	0.006	ND	ND
			16716	ND	0.001	ND	ND	ND	ND	ND

STATION ID: 1987 MOVEABLE STATION AT EAST HEADLAND LAKEFILL

LAT: 43 37 34.00 LONG: 079 19 24.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1115	1.0	11052	346.0	26.9	17.70	0.045	0.900	2.3	0.470	ND	ND	ND
			11053	341.0	20.3	14.00	0.039	0.810	2.2	0.560	ND	ND	ND
850717	1404	1.0	11880	326.0	6.5	7.40	0.023	0.320	2.0	0.130	ND	ND	ND
			11881	326.0	9.9	7.35	0.025	0.340	1.9	0.180	ND	ND	ND
850808	1103	3.0	15383	323.0	29.9	26.00	0.050	0.440	2.0	0.670	ND	ND	ND
			15384	323.0	34.1	29.00	0.046	0.410	2.0	0.730	ND	ND	ND
851017	1205	10.0	16671	320.0	11.2	8.30	0.053	0.210	2.0	2.000	ND	0.001	ND
			16672	320.0	9.5	5.8	0.059	0.230	2.1	1.100	ND	0.001	ND
851023	1050	7.0	16714	319.0	16.7	14.50	0.031	0.260	2.1	4.0000	ND	0.001	ND
			16713	320.0	83.4	56.00	0.013	0.270	2.1	4.3000	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1115	1.0	11052	0.002	0.003	0.01	0.002	0.004	ND	0.006
			11053	0.002	0.003	0.02	0.003	0.005	ND	0.009
850717	1404	1.0	11880	0.002	0.003	ND	0.002	ND	ND	0.003
			11881	0.003	0.004	0.01	0.002	ND	ND	0.004
850808	1103	3.0	15383	0.003	0.007	ND	0.002	0.007	ND	0.007
			15384	0.003	0.006	ND	0.002	0.007	ND	0.008
851017	1205	10.0	16671	0.001	0.002	0.01	0.002	0.009	ND	0.012
			16672	0.001	0.002	ND	ND	0.010	ND	0.009
851023	1050	7.0	16714	0.001	0.004	ND	0.004	0.070	ND	0.180
			16713	0.002	0.004	ND	0.004	0.093	ND	0.220

STATION ID: 1997 TORONTO WATERFRONT EASTERLY CONTROL

LAT: 43 40 39.00 LONG: 079 14 48.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1333	7.0	11058	323.0	0.3	1.18	0.009	0.230	1.9	0.011	ND	0.001	ND
			11059	323.0	1.1	2.30	0.010	0.240	1.9	0.016	ND	0.001	ND
850717	1756	5.5	11886	326.0	1.8	1.27	0.014	0.340	2.0	0.012	ND	ND	ND
			11887	325.0	1.6	1.57	0.013	0.340	1.9	0.016	ND	ND	0.0003
850808	0925	5.0	15377	317.0	1.7	3.60	0.020	0.330	2.1	0.014	ND	ND	ND
			15378	318.0	1.4	2.30	0.017	0.330	2.3	0.014	ND	ND	ND
851017	1414	4.0	16677	319.0	0.2	1.28	0.007	0.180	2.0	0.008	ND	0.001	ND
			16678	319.0	0.2	0.78	0.007	0.170	2.0	0.006	ND	0.001	ND
851023	0930	1.0	16707	318.0	0.6	1.08	0.009	0.210	2.0	0.022	ND	0.001	ND
			16708	317.0	0.3	1.16	0.021	0.270	2.1	0.021	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1333		11058	0.001	0.002	0.01	ND	ND	ND	0.002
			11059	ND	0.002	ND	ND	ND	ND	0.001
850717	1756		11886	0.002	0.004	ND	0.002	ND	ND	0.003
			11887	0.002	0.004	ND	0.002	ND	ND	0.003
850808	0925		15377	0.001	0.006	ND	0.001	ND	ND	0.002
			15378	0.001	0.005	0.01	0.001	ND	ND	0.005
851017	1414		16677	0.001	0.001	ND	ND	0.006	ND	ND
			16678	ND	0.001	ND	ND	ND	ND	ND
851023	0930		16707	ND	0.001	ND	ND	0.006	ND	ND
			16708	ND	0.001	ND	ND	0.004	ND	ND

STATION ID: 2017 MOVEABLE STATION NEAR DREDGING

LAT: 43 38 42.00 LONG: 079 21 33.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1434	1.0	11060	414.0	15.6	14.10	0.066	0.650	2.5	0.480	ND	ND	ND
			11062	467.0	20.4	18.50	0.069	1.770	2.7	0.560	ND	ND	ND
850808	1339	6.0	15389	413.0	34.0	31.00	0.089	0.900	2.5	0.960	ND	ND	ND
			15390	418.0	32.1	30.00	0.098	0.810	2.4	1.070	ND	ND	0.0002

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1434	1.0	11060	0.002	0.005	0.02	0.002	0.007	ND	0.012
			11062	0.003	0.004	0.02	0.003	0.011	ND	0.013
850808	1339	6.0	15389	0.011	0.009	ND	0.003	0.013	ND	0.016
			15390	0.012	0.010	ND	0.003	0.013	ND	0.018

STATION ID: 2020 LOWER DON RIVER AT OLD FRONT STREET BRIDGE

LAT: 43 39 17.00 LONG: 079 21 04.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1600	0.1	11068	894.0	18.9	13.80	0.157	1.830	5.0	0.590	ND	ND	ND
			11069	888.0	14.5	18.20	0.165	1.660	4.6	0.670	ND	ND	ND
850717	2030	0.1	11894	792.0	36.1	38.00	0.155	2.300	5.3	1.200	ND	ND	ND
			11895	792.0	34.7	38.00	0.160	2.300	5.3	1.200	ND	ND	ND
850808	1452	0.1	15392	917.0	7.2	10.70	0.230	2.250	--	0.350	ND	ND	0.0002
			15391	917.0	6.3	10.40	0.260	2.150	5.8	0.360	ND	ND	0.0002
851017	1710	0.1	16683	--	--	--	--	--	--	0.380	ND	ND	ND
			16684	--	--	--	--	--	--	0.390	ND	ND	ND
851023	1545	0.1	16727	1013.0	6.0	7.40	0.147	1.070	3.6	0.480	ND	ND	ND
			16728	1011.0	6.0	7.30	0.153	1.110	3.6	0.480	ND	ND	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1600	0.1	11068	0.005	0.023	--	0.008	ND	ND	0.030
			11069	0.010	0.041	--	ND	0.014	ND	0.034
850717	2030	0.1	11894	0.011	0.007	0.01	0.005	0.006	ND	0.023
			11895	0.012	0.008	0.01	0.005	0.006	ND	0.024
850808	1452	0.1	15392	0.029	0.017	0.01	0.013	0.006	ND	0.018
			15391	0.029	0.017	0.01	0.014	0.010	ND	0.016
851017	1710	0.1	16683	0.008	0.007	ND	0.004	0.008	ND	0.019
			16684	0.008	0.008	0.01	0.005	0.011	ND	0.021
851023	1545	0.1	16727	0.003	0.007	ND	0.004	0.009	ND	0.018
			16728	0.003	0.006	ND	0.004	0.011	ND	0.019

STATION ID: 2029 LAKE ONTARIO AT WESTERN INTAKE OF R.C. HARRIS FILTRATION PLANT

LAT: 43 40 07.00 LONG: 079 15 05.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850529	1310	7.0	11056	324.0	1.9	1.56	0.010	0.270	2.0	0.012	ND	0.001	ND
			11057	323.0	0.8	1.34	0.017	0.250	1.9	0.016	ND	0.001	ND
850717	1727	5.5	11884	326.0	1.2	1.53	0.013	0.320	2.0	0.017	ND	ND	ND
			11885	326.0	1.5	1.37	0.018	0.350	2.0	0.014	ND	ND	ND
850808	0953	4.0	15381	320.0	2.2	2.80	0.018	0.420	2.1	0.025	ND	ND	ND
			15382	319.0	2.3	2.90	0.017	0.360	2.1	0.028	ND	ND	ND
851017	1341	7.0	16675	322.0	4.8	1.31	0.007	0.250	2.0	0.010	ND	0.002	ND
	1350		16687	322.0	0.7	1.54	0.007	0.210	2.0	0.025	ND	0.001	ND
851023	0949	1.0	16709	318.0	0.5	1.10			2.1	0.012	ND	0.001	ND
			16710	318.0	0.2	1.08	0.010	0.220	2.0	0.008	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850529	1310	7.0	11056	ND	0.002	0.01	ND	0.001	ND	0.002
			11057	0.001	0.002	0.02	ND	ND	ND	0.002
850717	1727	5.5	11884	0.002	0.004	ND	0.002	ND	ND	0.004
			11885	0.002	0.004	ND	0.001	ND	ND	0.004
850808	0953	4.0	15381	ND	0.004	ND	0.001	ND	ND	0.001
			15382	0.004	0.004	ND	0.001	ND	ND	0.002
851017	1341	7.0	16675	0.001	0.001	ND	ND	ND	ND	ND
	1350		16687	0.002	0.001	ND	ND	0.006	ND	ND
851023	0949	1.0	16709	ND	0.001	ND	ND	0.007	ND	ND
			16710	ND	0.001	ND	.002	ND	ND	ND

STATION ID: 2054 HUMBER BAY AT MOUTH OF MIMICO CREEK

LAT: 43 37 08.00 LONG: 079 28 25.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850423	1053	1.5	11036	369.0	2.2	3.40	0.019	0.540	2.2	0.070	ND	ND	ND
			11037	375.0	2.9	3.00	0.020	0.590	2.2	0.069	ND	ND	ND
850529	0851	3.0	11044	369.0	5.3	7.80	0.029	0.650	2.4	0.220	ND	0.001	ND
			11045	363.0	4.3	5.80	0.031	0.700	2.4	0.240	ND	0.001	0.0007
850717	0901	1.5	11872	355.0	4.5	4.80	0.030	0.600	2.5	0.340	ND	ND	0.0004
			11873	356.0	4.6	6.30	0.040	0.660	2.4	0.340	ND	ND	0.0003
850807	1041	1.0	15369	337.0	4.0	4.60	0.053	0.560	2.4	0.140	ND	ND	ND
			15370	334.0	3.8	4.70	0.045	0.550	2.4	0.160	ND	0.001	ND
851017	0900	3.0	16663	350.0	2.6	1.96	0.027	0.590	2.1	0.085	ND	ND	ND
			16664	351.0	3.5	2.40	0.027	0.560	2.1	0.110	ND	0.001	ND
851023	1240	3.0	16717	382.0	2.2	1.57	0.050	1.200	2.7	0.079	ND	0.001	ND
			16731	382.0	1.9	1.83	0.062	1.420	2.6	0.084	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850423	1053	1.5	11036	0.003	0.003	0.07	0.003	ND	ND	0.004
			11037	0.003	0.003	0.04	0.002	ND	ND	0.004
850529	0851	3.0	11044	0.002	0.002	0.01	0.003	0.004	ND	0.008
			11045	0.003	0.007	0.01	0.006	0.007	ND	0.030
850717	0901	1.5	11872	0.005	0.007	0.01	0.004	0.005	ND	0.050
			11873	0.004	0.006	0.01	0.004	0.003	ND	0.049
850807	1041	1.0	15369	0.003	0.006	ND	0.002	ND	ND	0.005
			15370	0.002	0.006	ND	0.002	ND	ND	0.004
851017	0900	3.0	16663	0.001	0.001	ND	0.005	0.003	ND	0.016
			16664	0.001	0.001	ND	0.005	ND	ND	0.013
851023	1240	3.0	16717	0.001	0.001	ND	0.014	ND	ND	0.005
			16731	0.001	0.002	ND	0.014	0.003	ND	0.005

STATION ID: 2072 HUMBER BAY AT HUMBER STP DISCHARGE

LAT: 43 37 34.00 LONG: 079 28 04.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850423	1132	3.0	11039	438.0	6.4	4.20	0.140	1.830	3.0	0.630	ND	ND	0.0002
			11040	518.0	8.6	4.40	0.255	3.450	3.7	0.430	ND	ND	ND
850529	0930	2.0	11046	443.0	6.3	4.60	0.208	0.340	3.3	0.320	ND	0.001	0.0030
			11047	440.0	6.5	5.70	0.149	2.250	3.4	0.450	ND	0.001	ND
850717	1000	2.5	11874	478.0	17.2	11.50	0.233	2.000	4.0	0.940	ND	0.001	0.0008
			11875	476.0	17.8	12.40	0.225	1.970	4.2	0.970	ND	ND	0.0008
850807	1056	5.0	15371	325.0	4.0	5.60	0.375	4.650	4.2	0.080	ND	0.001	ND
			15372	325.0	4.4	4.80	0.395	4.950	4.4	0.080	ND	ND	ND
851017	1000	2.0	16665	420.0	5.0	2.20	0.273	2.220	2.8	0.7300	ND	0.001	0.0005
			16666	402.0	4.3	2.50	0.285	1.050	2.7	0.7700	ND	0.001	0.0007
851023	1300	1.0	16719	441.0	4.2	3.40	0.164	2.100	3.1	0.530	ND	0.001	0.0003
			16720	442.0	5.1	4.80	0.175	2.270	3.2	0.540	ND	0.001	0.0004

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850423	1132		11039	0.007	0.006	0.03	0.017	ND	ND	0.028
			11040	0.006	0.005	0.04	0.011	ND	ND	0.019
850529	0930		11046	0.012	0.020	0.01	0.027	0.074	ND	0.028
			11047	0.006	0.006	0.02	0.029	0.002	ND	0.031
850717	1000		11874	0.014	0.010	0.02	0.022	0.003	ND	0.036
			11875	0.014	0.010	0.01	0.022	0.004	ND	0.036
850807	1056		15371	0.004	0.006	0.02	0.002	ND	ND	0.003
			15372	0.003	0.006	ND	0.002	ND	ND	0.004
851017	1000		16665	0.013	0.006	0.01	0.022	ND	ND	0.066
			16666	0.018	0.009	0.02	0.023	ND	ND	0.080
851023	1300		16719	0.008	0.005	ND	0.028	ND	ND	0.029
			16720	0.008	0.005	0.04	0.030	ND	ND	0.031

STATION ID: 9053 HUMBER BAY AT MOUTH OF HUMBER RIVER

LAT: 43 27 51.00 LONG: 79 28 10.00

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CONDUCT. 25C UMHO/CM AT 25 C	RESIDUE PARTIC. MG/L	TURB'ITY FTU	PHOSPHOR UNF.TOT. MG/L AS P	K'DAHL N TOTAL FIL.TOT. MG/L AS N	CARBON DISOLVED ORGANIC MG/L AS C	IRON UNF.TOT. MG/L AS FE	SILVER UNF.TOT. MG/L AS AG	ARSENIC UNF.TOT. MG/L AS AS	CADMIUM UNF.TOT. MG/L AS CD
850423	1226	1.5	11041	423.0	8.7	8.80	0.032	0.380	2.4	0.300	ND	ND	ND
			11042	425.0	7.7	6.10	0.030	0.420	2.3	0.150	ND	ND	ND
850529	0955	2.0	11048	416.0	12.5	11.70	0.044	0.670	2.7	0.300	ND	ND	ND
			11049	442.0	14.9	17.20	0.042	0.660	2.9	0.330	ND	ND	ND
850717	1020	1.0	11876	364.0	17.4	23.00	0.082	0.730	2.4	1.400	ND	ND	0.0003
			11877	356.0	13.8	18.30	0.083	0.740	2.3	1.400	ND	ND	0.0003
850807	1122	1.0	15373	421.0	9.9	9.20	0.102	1.730	2.9	0.280	ND	ND	ND
			15374	444.0	11.0	10.80	0.116	1.720	3.1	0.290	ND	ND	0.0002
851017	1005	1.0	16667	400.0	4.7	3.10	0.032	0.600	2.5	0.2900	ND	0.001	ND
			16668	443.0	6.4	5.20	0.030	0.610	3.0	0.2200	ND	0.001	ND
851023	1315	1.0	16721	372.0	2.1	2.40	0.013	0.280	2.5	0.042	ND	0.001	ND
			16722	373.0	2.1	2.30	0.012	0.260	2.5	0.055	ND	0.001	ND

SAMPLE DATE YYMMDD	HOUR LMT	SAMP DEPTH MTRS	SAMP NO.	CHROMIUM UNF.TOT. MG/L AS CR	COPPER UNF.TOT. MG/L AS CU	MERCURY FIL.TOT. UG/L AS HG	NICKEL UNF.TOT. MG/L AS NI	LEAD UNF.TOT. MG/L AS PB	SELENIUM UNF.TOT. MG/L AS SE	ZINC UNF.TOT. MG/L AS ZN
850423	1226		11041	0.005	0.004	0.03	0.002	ND	ND	0.004
			11042	0.003	0.003	ND	0.001	ND	ND	0.003
850529	0955		11048	0.002	0.002	0.01	0.004	0.002	ND	0.008
			11049	0.002	0.002	0.01	0.003	0.004	ND	0.006
850717	1020		11876	0.009	0.007	0.02	0.006	0.006	ND	0.016
			11877	0.009	0.007	0.01	0.006	0.005	ND	0.015
850807	1122		15373	0.004	0.007	ND	0.005	0.003	ND	0.007
			15374	0.004	0.007	ND	0.005	0.003	ND	0.006
851017	1005		16667	0.002	0.003	ND	0.002	ND	ND	0.004
			16668	0.002	0.003	ND	0.003	ND	ND	0.004
851023	1315		16721	ND	0.001	ND	ND	0.006	ND	0.001
			16722	ND	0.001	ND	ND	ND	ND	0.001

REMARKS: "ND" SIGNIFIES NOT DETECTED ABOVE MINIMUM MEASURABLE AMOUNT

"--" SIGNIFIES NO RESULT AVAILABLE

RESULTS OF CENTRIFUGE WATER QUALITY SAMPLING

STATION	DATE ddmmyy	COND25 uS/cm	SUSP.SOL mg/l	TURB. FTU	Fe mg/l	Total P mg/l	TKN mg/l	DOC mg/l	Cd ug/l	Cr ug/l	Cu ug/l	Hg ng/l	Ni ug/l	Pb ug/l	Zn ug/l	a-BHC ng/l	b-BHC ng/l	g-BHC ng/l	Hepchlr ng/l	Hepchlr ng/l	pp-DDE mg/l	DMDT ng/l	Dieldrin ng/l	Aldrin ng/l	HCB ng/l	Octchlst ng/l
HUMBER	250485	1163.00	22.07	7.00	3.60	0.76	12.00	15.10	0.40	27.00	12.00	80.00	83.00	4.00	120.00	-	-	-	-	-	-	-	-	-	-	-
STP	20585	1122.00	20.72	6.40	2.86	0.88	14.70	11.00	2.90	18.00	10.00	-	104.00	3.00	97.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	270685	956.00	25.92	24.00	0.85	2.30	16.50	16.00	0.50	4.00	ND	-	33.00	ND	15.00	ND	ND	19	ND	ND	ND	ND	ND	ND	ND	ND
	171085	1002.00	19.30	10.20	8.50	0.90	11.50	7.30	2.00	64.00	24.00	110.00	160.00	16.00	230.00	4	ND	33	3	ND	ND	ND	ND	ND	2	ND
	211085	922.00	9.19	4.30	1.90	0.41	15.20	7.20	1.00	16.00	14.00	50.00	170.00	17.00	97.00	5	ND	39	4	ND	ND	ND	ND	ND	4	ND
MAIN	240485	1126.00	10.97	10.70	1.30	1.00	28.50	0.40	2.00	45.00	40.00	60.00	120.00	13.00	70.00	-	-	-	-	-	-	-	-	-	-	-
STP	10585	1086.00	9.17	4.20	0.06	0.45	26.20	14.00	0.90	25.00	24.00	-	39.00	7.00	32.00	ND	ND	26	8	3	ND	ND	3	ND	ND	ND
	10685	933.00	16.92	17.40	0.73	0.63	25.70	16.50	0.90	31.00	23.00	80.00	65.00	20.00	46.00	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND
	280685	985.00	20.50	12.50	1.10	0.73	3.50	11.30	2.00	41.00	30.00	30.00	49.00	ND	68.00	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	181085	975.00	36.62	34.00	2.40	2.10	30.20	13.50	6.00	76.00	71.00	150.00	65.00	39.00	170.00	1	ND	21	3	ND	ND	ND	ND	ND	7	ND
	221095	965.00	11.96	9.90	1.50	0.67	28.00	15.70	5.00	54.00	57.00	70.00	62.00	30.00	100.00	2	ND	30	2	ND	ND	ND	ND	6	7	ND
MIMICO	220485	1360.00	36.26	25.00	1.10	0.11	0.80	3.50	0.30	14.00	12.00	80.00	3.00	14.00	32.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CREEK	40585	1278.00	39.04	45.00	1.70	0.11	0.99	4.40	ND	13.00	10.00	40.00	3.00	31.00	50.00	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10685	422.00	16.63	26.00	0.79	0.05	0.56	2.50	ND	4.00	4.00	20.00	2.00	14.00	22.00	ND	1	ND	ND	ND	1	ND	ND	ND	ND	ND
	240685	376.00	15.79	18.50	0.04	0.05	0.66	2.60	ND	ND	ND	10.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	191085	378.00	130.80	78.00	5.40	0.28	0.84	3.20	1.00	29.00	26.00	70.00	9.00	75.00	220.00	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	231085	1029.00	13.54	12.60	0.70	0.07	0.74	3.90	ND	13.00	8.00	30.00	6.00	15.00	34.00	2	ND	1	ND	ND	ND	ND	ND	ND	ND	ND
LAKEFILL	60585	344.00	30.48	19.50	0.73	0.05	1.41	2.80	ND	3.00	4.00	10.00	ND	11.00	11.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	70585	315.00	6.20	3.90	0.10	0.02	0.39	2.30	ND	1.00	1.00	10.00	ND	3.00	3.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	241085	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	41285	334.00	15.23	23.00	0.69	0.04	0.26	2.00	ND	1.00	3.00	ND	2.00	ND	7.00	3	ND	ND	ND	ND	ND	ND	ND	ND	1	ND
	61285	328.00	35.71	33.00	1.10	0.04	0.26	2.00	ND	2.00	4.00	50.00	2.00	ND	14.00	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	91285	334.00	8.56	8.80	0.13	0.02	0.25	2.00	ND	-	3.00	10.00	ND	ND	3.00	4	ND	2	ND	ND	ND	ND	ND	ND	2	ND
DON	30585	1014.00	30.23	21.00	0.89	0.19	2.35	4.90	0.20	13.00	10.00	10.00	5.00	13.00	22.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RIVER	40585	1101.00	12.62	16.20	0.88	0.18	2.72	4.00	ND	8.00	10.00	40.00	5.00	24.00	29.00	3	ND	31	ND	ND	ND	ND	ND	ND	ND	ND
	10685	787.00	17.09	28.00	0.92	0.14	1.99	4.20	ND	4.00	5.00	20.00	16.00	ND	17.00	ND	ND	5	ND	2	1	ND	3	ND	ND	ND
	280685	860.00	46.03	42.00	0.91	0.16	1.20	3.60	ND	3.00	3.00	20.00	5.00	ND	12.00	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND
	191085	378.00	86.65	41.00	2.90	0.18	0.58	2.70	ND	8.00	15.00	120.00	6.00	43.00	75.00	2	ND	3	3	ND	ND	ND	ND	ND	2	ND
	221085	930.00	9.76	7.90	0.66	0.13	1.30	4.30	ND	7.00	6.00	30.00	5.00	10.00	27.00	2	ND	10	2	ND	ND	ND	16	ND	2	ND
HUMBER	230485	678.00	23.36	19.00	0.64	0.06	0.57	4.50	0.20	6.00	6.00	20.00	ND	ND	9.00	2	ND	1	ND	ND	ND	ND	ND	ND	ND	ND
RIVER	40585	610.00	30.66	26.00	1.20	0.05	0.60	4.30	ND	5.00	5.00	20.00	ND	17.00	18.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10685	557.00	69.95	84.00	1.60	0.14	0.85	4.30	ND	3.00	3.00	20.00	ND	18.00	14.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	270685	636.00	44.68	50.00	0.34	0.09	0.71	4.50	ND	1.00	ND	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	191085	624.00	33.09	19.50	1.00	0.05	0.42	4.10	0.40	12.00	10.00	20.00	4.00	25.00	27.00	1	ND	2	3	ND	ND	ND	ND	ND	8	ND
	231085	720.00	13.11	15.30	0.59	0.04	0.54	5.50	ND	4.00	4.00	30.00	2.00	6.00	11.00	2	ND	1	ND	ND	ND	ND	ND	ND	ND	ND

APPENDIX D: 1985 TORONTO WATERFRONT SUSPENDED SEDIMENT QUALITY TESTS

Physical Parameters, Nutrients, and Trace Metals

Resid. Total, % Loss on IGN
Percent

Phosphorus, UNF. Total
mg/g dry

Arsenic, UNF. Total
ug/g dry

Cadmium, UNF. Total
ug/g dry

Chromium, UNF. Total
ug/g dry

Copper, UNF. Total
ug/g dry

Mercury, UNF. Total
ug/g dry

Nickel, UNF. Total
ug/g dry

Lead, UNF. Total
ug/g dry

Zinc, UNF. Total
ug/g dry

Organochlorine Compounds

PCB, Total ng/g dry

Hexachlorobenzene, ng/g dry

Heptachlor, ng/g dry

Aldrin, ng/g dry

PP-DDE, ng/g dry

Mirex, ng/g dry

A-BHC (Hexachlorocyclohexane) ng/g dry

B-BHC (Hexachlorocyclohexane) ng/g dry

G-BHC (Hexachlorocyclohexane) ng/g dry

A-Chlordane, ng/g dry

G-Chlordane, ng/g dry

Oxychlordane, ng/g dry

OP-DDT, ng/g dry

PP-DDD, ng/g dry

PP-DDT, ng/g dry

DMDT (Methoxychlor), ng/g dry

Heptachlorepoxide, ng/g dry

Endosulfan I, ng/g dry

Dieldrin, ng/g dry

Endrin, ng/g dry

Endosulfan II, ng/g dry

Endosulfan Sulphate, ng/g dry